VOL. XXIV. Nº2 FEBRUARY 1939

MECCANO MAGAZINE

PREPARING STEEL FOR CASTINGS

6D.

MECCANO

ENGINEERING FOR BOYS

EVERY OUTFIT BIGGER–so that you can build more models. EVERY MODEL BETTER–so that you can get more fun making and playing with each one. Boys, these thrilling improvements have made Meccano more than ever the greatest hobby in the world!

Bridges, towers, cranes, aeroplanes, ships–Meccano parts make them all. Think of the endless fun you could have building and working these magnificent models.

The thrill of Meccano model-building never ends–there is always something new to make and something new to invent.

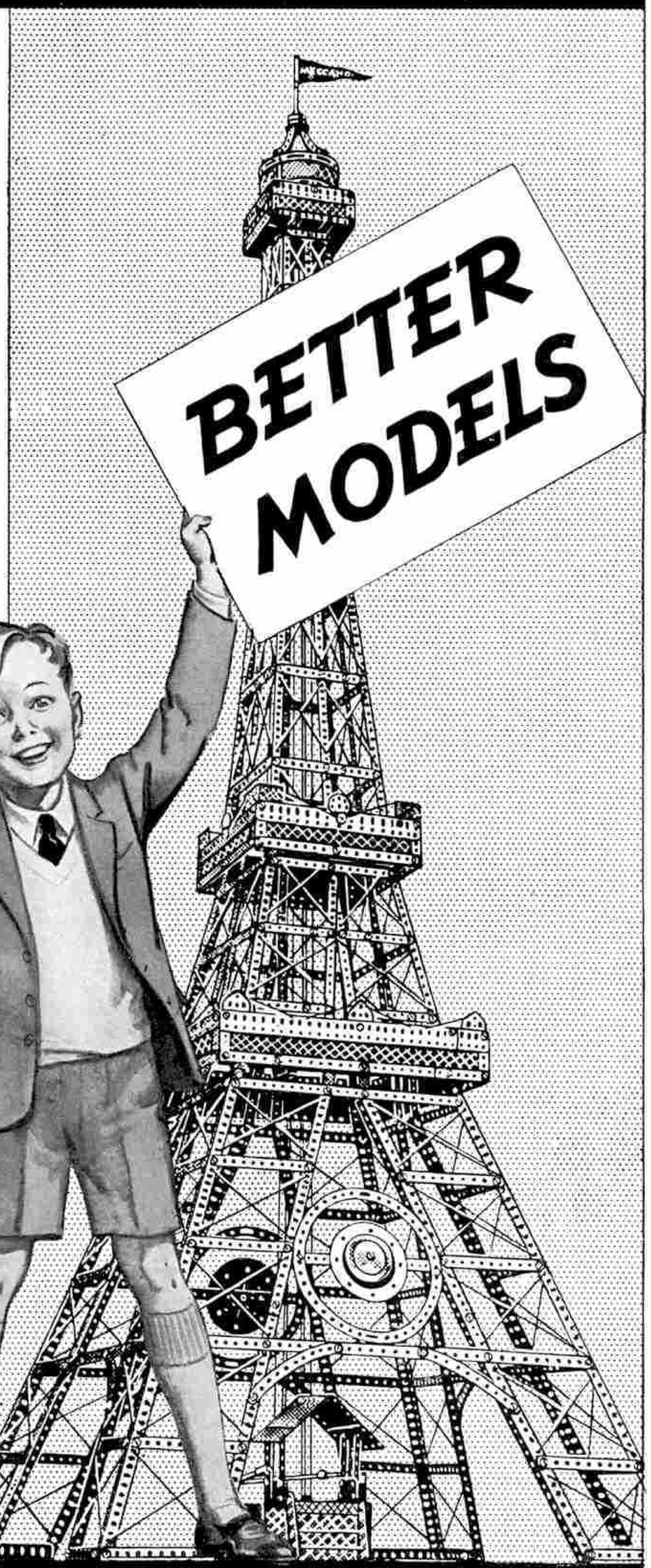
Your dealer will be glad to show you the latest Meccano Outfits. See him to-day.

Prices of Complete Outfits from 3/- to 255/-

A fine new Catalogue—FREE to boys

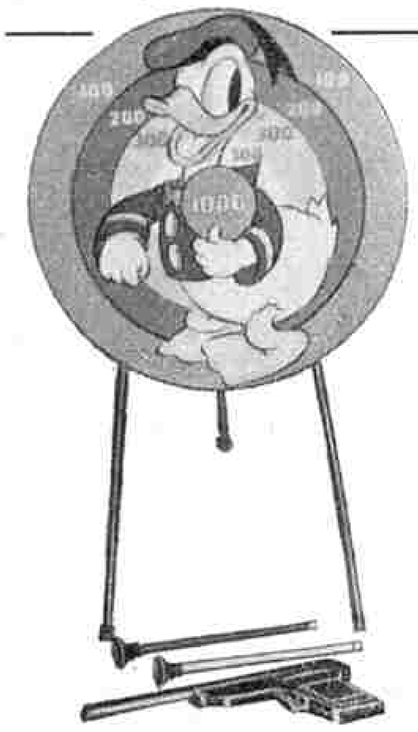
You must have this complete 72-page catalogue. Get it from your dealer to-day, or write direct to us for a copy, enclosing the names and addresses of three of your chums. The catalogue contains full details of the complete range of Meccano Quality Toys.

MECCANO LIMITED (DEPT. AM)
BINNS ROAD, LIVERPOOL 13



IT'S REAL– IT WORKS – IT'S MECCANO

FOOTBALL FAN SCOOPS HUGE POOL!

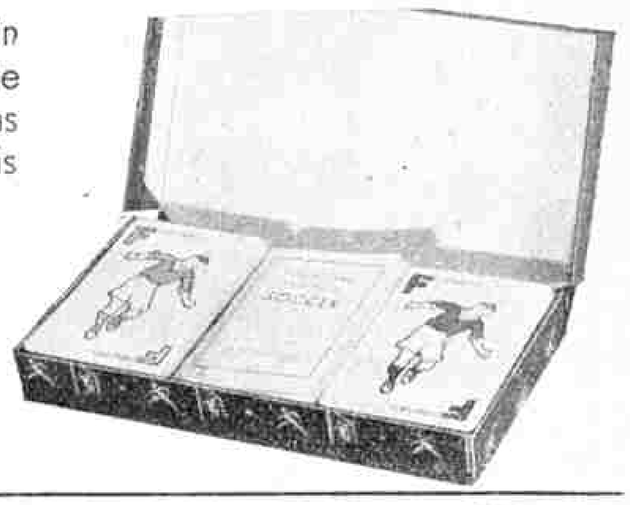


DONALD DUCK SHOOTING GAME

Here's our popular friend Donald popping up again in a new form—'Popping' is right, too, because you 'pop' at him with a suction dart and pistol. Very strong and gaily coloured.

PRICE **2/11** POST 4d.

Tommy's done it again! For the third time in succession he's succeeded in getting a complete team of Blue Devils before anyone else and has scooped the pool! He's a real dab at this intriguing game of SOCCER which everyone is playing. Played with special cards, the object is to collect a full football team. The first to do so wins.



SOCCER CARD GAME PRICE **2/6** POST 3d.

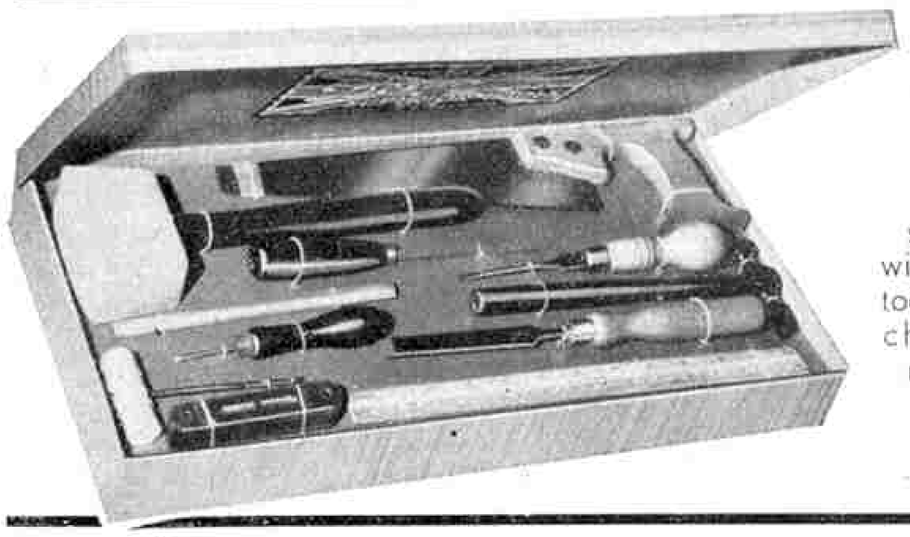
SNOW WHITE CARD GAME

Here's a grand card game featuring your favourite cartoon. Each card is a perfectly coloured representation of a character from 'Snow White.' Played similarly to Rummy.



PRICE **1/6** POST 2d.

By Appointment to H. M. Queen Mary



JUVENILE TOOL SET

There's nothing like a little carpentry to amuse your idle hours—and you can make some topping bookcases, etc., with this tool set. Contains 11 tools, including saw, chisel, hammer, mallet, spirit level, also workman's apron.

PRICE **9/6** POST 6d.

Telephone: Regent 3161

Hamleys Estd 1760 HAMLEY · BROTHERS · LTD

Our Only Address: 200-202, REGENT STREET, LONDON W.1.

QUICK!

HAND ME THAT RETORT STAND!

When you're in the middle of an interesting experiment and success depends on your having everything just so, then you need those useful extra stands, flasks, gas-jars and all the other fine apparatus shown in Lott's Chemistry Spares List.

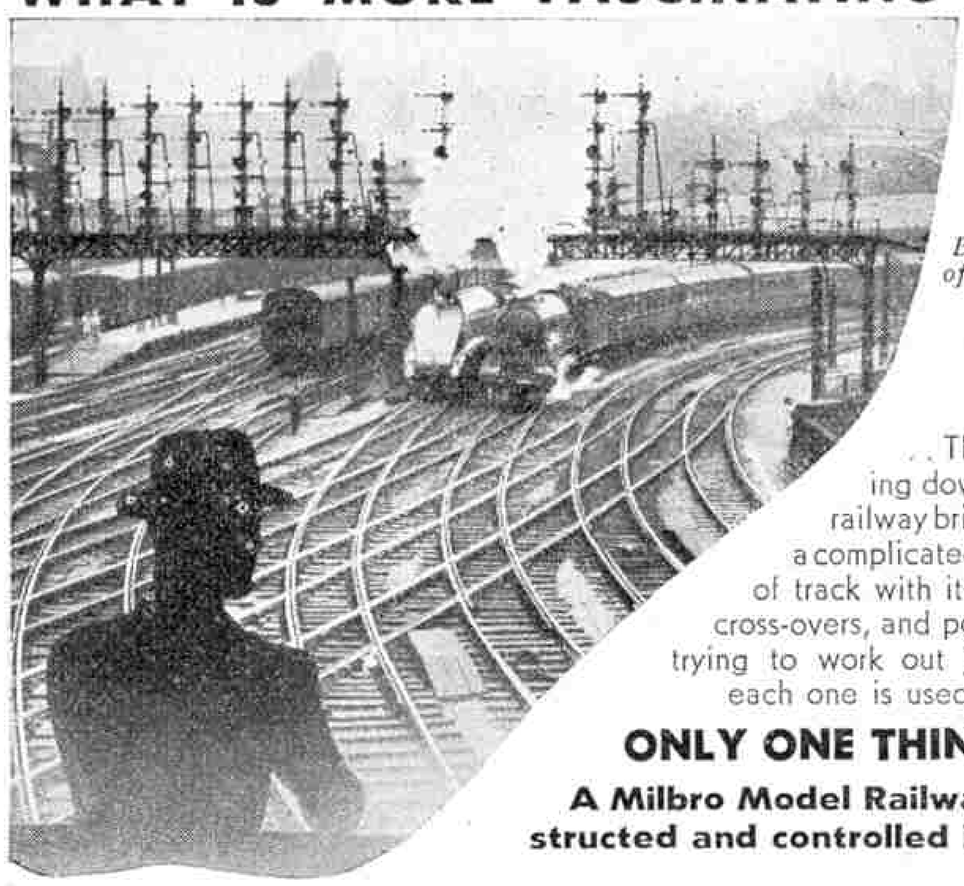
LOTT'S CHEMISTRY is more fun than ever with these super spares!

LOTT'S BRICKS (New Series) are great fun, too! You can build modern houses, garages, stations, etc., all with the new Sun Trap Windows. Your toy dealer has them in smart Silver Boxes with transparent windows, at 3/6, 5/–, 7/6 and 10/–.

Write for FREE Chemistry Spares List and lists of all Lott's Products to Dept. M.M. (1d. stamp on p.c., 1½d. stamp on letters, please.)

LOTT'S BRICKS LTD WATFORD HERTS.

WHAT IS MORE FASCINATING . . . .



By courtesy of L.N.E.R.

. . Than looking down over a railway bridge on to a complicated network of track with its sidings, cross-overs, and points, and trying to work out just what each one is used for?

ONLY ONE THING . . .

A Milbro Model Railway constructed and controlled by you.

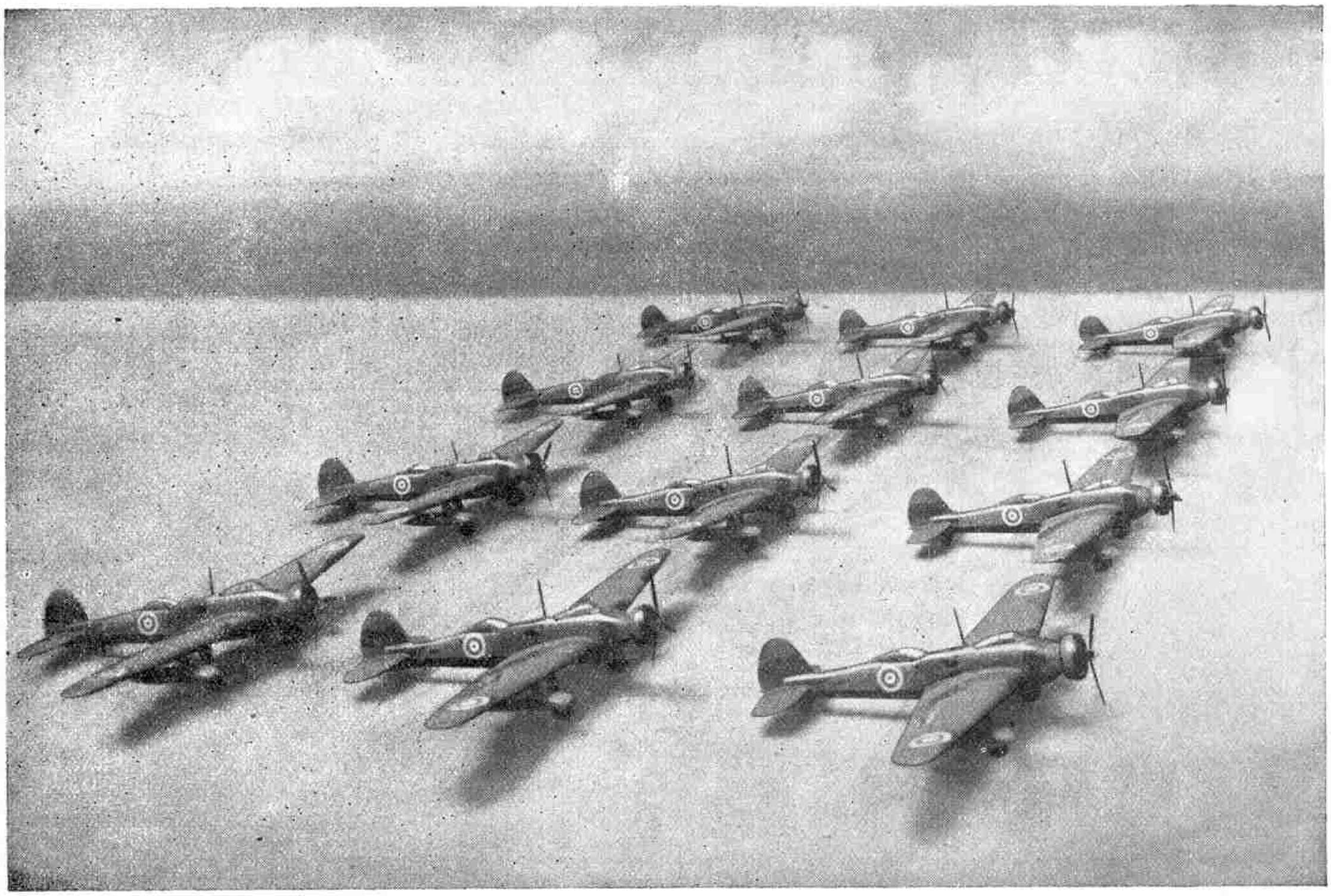
Standard Electric Tank Locomotive 4-4-2
Gauge 0, 6-8 volts.
In railway colours or black, **£2-19-6**

'PERMANWAY' POINTS. *Gauge 0. C.W.* **6/-.** *Electric (fully insulated switches)* **7/6.**
See Catalogue for other specifications and prices.

WRITE FOR 100 PAGE ILLUSTRATED CATALOGUE. PRICE **6d.**

MILBRO TRUE-TO-SCALE *replicas for reliability*

MILLS BROS. (Model Engineers) LTD., Dept. M.M., ST. MARY'S ROAD, SHEFFIELD
London Showrooms: 2, Victoria Colonnade, Victoria House, Southampton Row, W.C.1



VICKERS WELLESLEY KIT 7/6 MADE UP 15/-

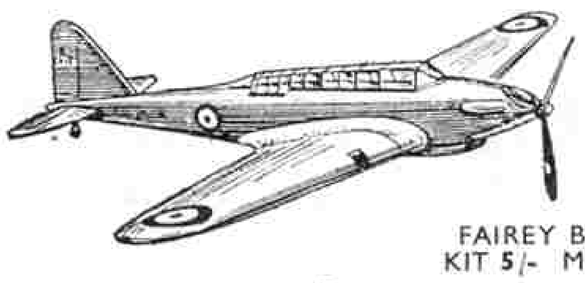
Vickers Wellesley

bombers at the ready!

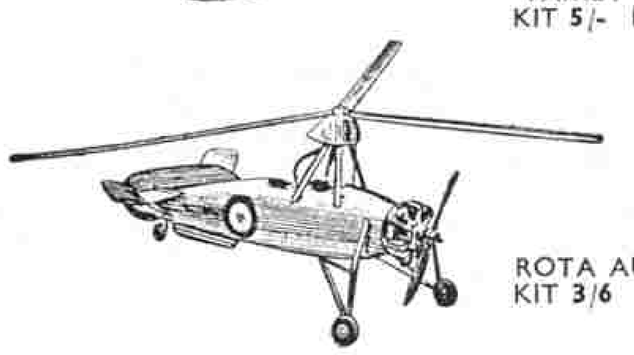
You can almost hear the engines warming up. But no! they are really models—real models—Penguin models.

These Vickers Wellesley bombers are typical of the Penguin range of models, which includes civil and service aircraft of particular interest.

Penguin kits include all parts correctly shaped, and the easy-to-follow diagrams simplify construction. Alternatively, the models can be obtained already completed and finished in the correct colours.



FAIREY BATTLE
KIT 5/- MADE UP 8/6



ROTA AUTOGIRO
KIT 3/6 MADE UP 6/6

FROG ready to fly models are obtainable from 1/- to 42/-, flying construction kits from 1/6 to 21/-, and Penguin non-flying scale models from 3/- to 21/-

See them at your local toyshop or post coupon below.

A new branch of the famous FROG Service is the introduction of comprehensive kits of material, including Balsa wood, fully-shaped airscrews, etc. Details can be obtained from your FROG stockist.

FROG PENGUIN
NON-FLYING SCALE MODELS

Obtainable at all good toyshops and stores. Covered by World Patents granted and pending. Made in England by International Model Aircraft Ltd. Sole Concessionaires:

LINES BROS. LTD., Tri-ang Works, Morden Rd., S.W.19

TRADE MARK REGD.

COUPON *To Lines Bros. Ltd. (Dept. 5), Morden Road, London, S.W.19*

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled "Frog" Pilot badges.

NAME .....

ADDRESS .....

..... 2/39

The finest hobby for any boy

Just a few Fretwork Tools and you can make almost anything you like in wood—to use, to give away, even to sell for pocket money. No hard work or expensive kit. You can start right away with any Hobbies Fretwork Outfit costing anything from 1/6 upwards.

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There's no catch in it. With a Hobbies Fretwork Outfit you can make all sorts of useful articles to sell to the people at home or to friends. Some fellows even work up a big and profitable little spare-time business selling to shops. Things like calendars, trays, stools, clocks, mystery boxes, galleons, jig-saws, puzzles, etc.—all sell quite easily—and you enjoy making them, too. Large free patterns are given with Hobbies Weekly (2d. every Wednesday) and there are nearly 1,000 things you can make (as well as gift design sheets for building Big Ben and a Paddle Steamer, worth 2/–), in the 284-page Hobbies Handbook, obtainable for 6d. from any newsagent.

HOBBIES

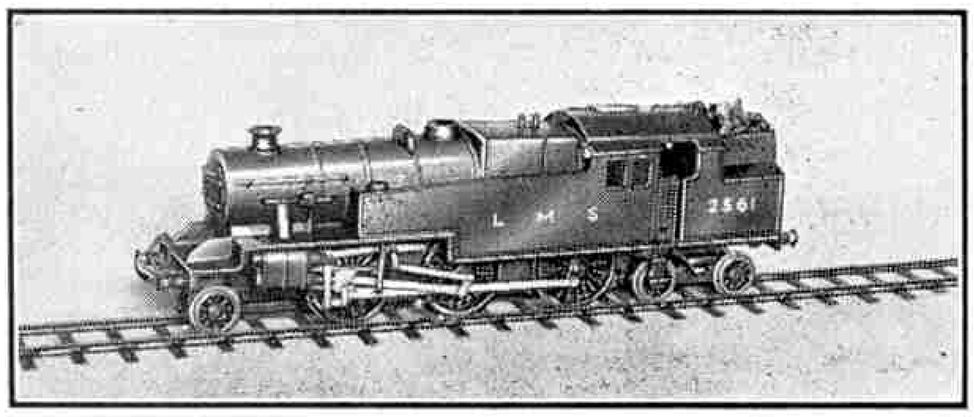
BRITISH FRETWORK OUTFITS

Nothing like a Fretwork Set to keep you really happy doing something useful in your spare time. Lots of fellows are doing it now—so why not you?



Obtainable from any ironmonger, stores, or toy shops or Hobbies Branch. Orders by post or free illustrated leaflets and specimen Hobbies from Dept. 96, Hobbies Ltd., Dereham, Norfolk.

SCALE MODEL RAILWAYS



Send 6d. in stamps for 48 page Illustrated Catalogue

GEORGE E. MELLOR (Dept. M.4) 5. BREWIS ROAD RHOS-ON-SEA. N.WALES

Build your own engine

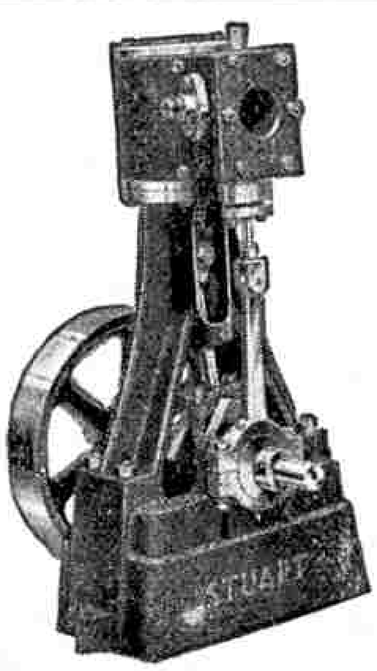
Only a few hand tools required.

Stuart No. 10.
Completely machined set with full instructions:
from **18/6** post free.

All our sets from 5/– upwards, illustrated and described in our No. 2 catalogue, 6d. post free.

72 pages fully illustrated.

STUART TURNER LTD.
Henley-on-Thames



Your Photography



can be made more interesting and more economical if you do your own developing and printing.

LEARN TO DO THIS MOST FASCINATING PART OF YOUR HOBBY **NOW** BY SENDING FOR OUR FREE INSTRUCTION BOOK showing "How to do your own Developing." "How to do GASLIGHT PRINTING." "How to do FLASHLIGHT," ENLARGING, etc.



- **A Trial Set of Chemicals for 1'7 including:**
- **1-oz. bottle of AZOL, to develop 12 spools 3¼ X 2¼.**
- **4-oz. tin ACID-FIXING, to make 30 to 60 oz. solution.**
- **1 Packet M.-Q. Developer, sufficient to make 3 dozen Gaslight Prints.**

Address letters E/M Dept.

JOHNSON & SONS *Manufacturing Chemists Ltd.* **HENDON London N.W.4**

PERFECT SCALE MODELS

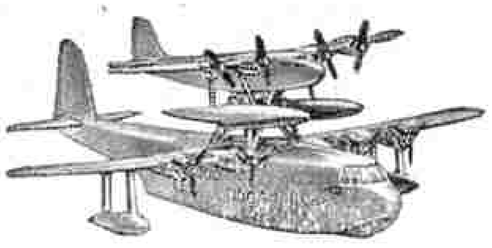
DINKY TOYS

OVER 300 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. This season many new items have been introduced including scale models of the latest types of Aeroplanes, notable among which is a wonderful model of the Mayo Composite Aircraft.

Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

MAYO COMPOSITE AIRCRAFT



Dinky Toys No. 63

Scale model of the Mayo Composite Aircraft. Price **2/-** each

The components of the above can be purchased separately.
No. 63a Flying Boat "*Maia*" ... **1/3** each
No. 63b Seaplane "*Mercury*" ... **9d.** each

FLYING BOAT "CLIPPER III"



Dinky Toys No. 60w

Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937

Price **1/-** each

ARMSTRONG WHITWORTH "WHITLEY" BOMBER



Dinky Toys No. 60v

Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F. Price **9d.** each

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

(With Shadow Shading) Dinky Toys No. 62t

Similar to Dinky Toys No. 60v but with Air Ministry Shadow Shading. Price **11d.** each

IMPERIAL AIRWAYS "FROBISHER" CLASS LINER



Dinky Toys No. 62w

Scale models of the Imperial Airways "Frobisher" class liners. Three models available, named: "*Frobisher*," "*Falcon*" and "*Fortuna*." Price **10d.** each

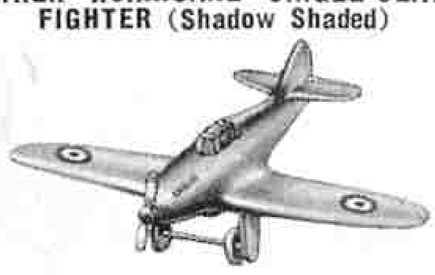
Ready during February.

DE HAVILLAND "ALBATROSS" MAIL LINER

Dinky Toys No. 62r

Scale model of one of the "Albatross" mail liners built for the Air Ministry for experimental flights. Price **10d.** each

HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Shadow Shaded)



Dinky Toys No. 62h

Scale model of the Hawker "Hurricane" single-seater Fighter extensively used by the R.A.F. Price **6d.** each

Ready during February.

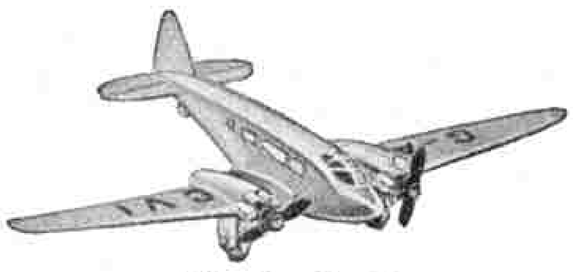
HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Aluminium Finish)

Dinky Toys No. 62s

Similar to Dinky Toys No. 62h, but with Aluminium finish. Price **6d.** each

Ready during February.

AIRSPEED "ENVOY" MONOPLANE



Dinky Toys No. 62m

Scale model of the Airspeed "Envoy" twin-engined commercial monoplane. Assorted colours. Price **6d.** each

THE KING'S AEROPLANE

Dinky Toys No. 62k

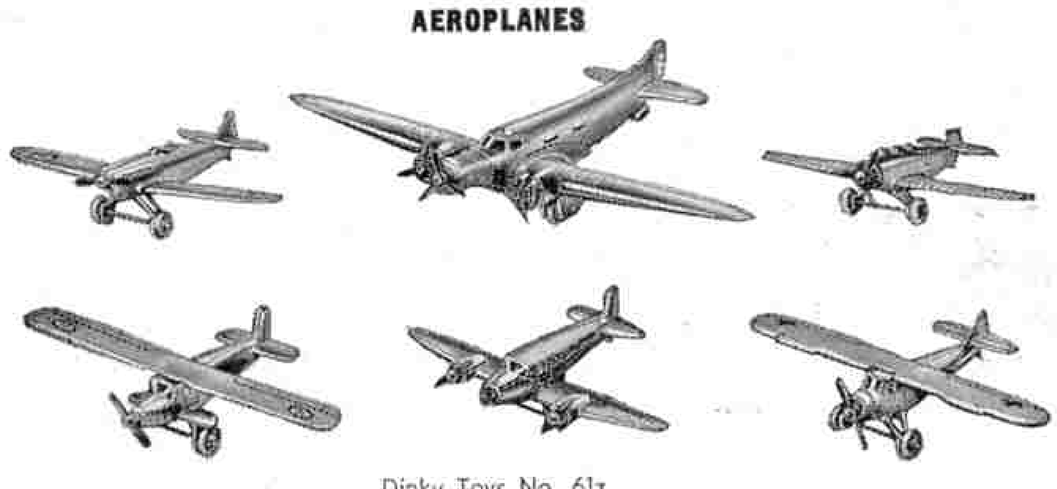
Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight. Price **8d.** each

IMPORTANT TO READERS

Do not pay more for Dinky Toys than the prices quoted in these pages.

Some readers, on responding to advertisements in a contemporary, have been supplied with Dinky Toys model aeroplanes at prices much in excess of the makers' prices. Readers who respond to such advertisements are strongly advised to make enquiries of the advertisers as to the make of the model aeroplanes before making their purchases.

AEROPLANES



Dinky Toys No. 61z

This set consists of six models of French Aeroplanes—Dewoitine 338, Dewoitine 500d, Potez 58, Potez 56, Hanriot H180M and Farman F360. (Made in the Meccano Factory in Paris.) Price **3/-**

JUNKERS Ju 90 AIR LINER



Dinky Toys No. 62n

Scale model of the latest type of German air liner, having a top speed of 256 m.p.h. Price **11d.** each

GIANT HIGH-SPEED MONOPLANE

Dinky Toys No. 62y

Similar in type to Junkers "Ju 90" Air Liner. Assorted colours. Price **11d.** each

Ready during February.

FAIREY "BATTLE" BOMBER



Dinky Toys No. 60n

Model of the Fairey "Battle" day bomber, a type much used by the R.A.F. It carries a pilot and gunner. Price **4½d.** each

REFUELLING TENDER



Dinky Toys No. 60y

Realistic model of Thompson Bros. Tender used for refuelling aeroplanes at aerodromes. Price **8d.** each

EMPIRE FLYING BOATS



Dinky Toys No. 60r

Scale models of the famous Imperial Airways Flying Boats. Twelve models available named: "*Caledonia*," "*Canopus*," "*Corsair*," "*Challenger*," "*Centurion*," "*Cambria*," "*Capella*," "*Ceres*," "*Clio*," "*Calypso*," "*Corinna*" and "*Cheviot*." Price **1/-** each

ATLANTIC FLYING BOAT

Dinky Toys No. 60x

Similar in type to the Empire Flying Boat. Assorted colours. Price **1/-** each

ARMSTRONG WHITWORTH "ENSIGN" AIR LINER



Dinky Toys No. 62p

Scale model of the largest British air liner. Six models available, named: "*Ensign*," "*Elsinore*," "*Explorer*," "*Echo*," "*Ettrick*" and "*Elysian*." Price **1/-** each

BRITISH 40-SEATER AIR LINER

Dinky Toys No. 62x

Similar in type to the Armstrong Whitworth "Ensign" Air Liner. Assorted colours. Price **1/-** each

Ready during February.

DOUGLAS D.C.3 AIR LINER



Dinky Toys No. 60t

A scale model of a Douglas D.C.3 air liner, a type in regular service on American and European routes. Price **9d.** each

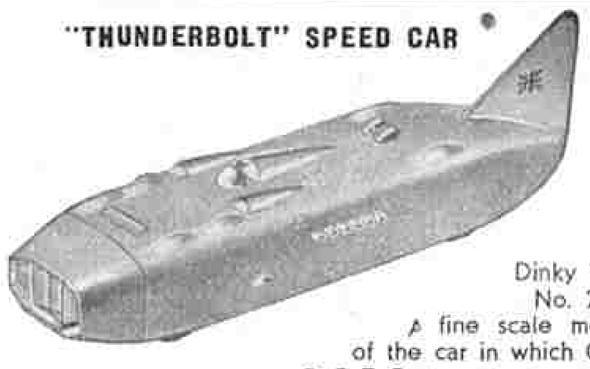
MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

A FASCINATING COLLECTING HOBBY

DINKY TOYS

FINISHED IN RICH COLOURS

"THUNDERBOLT" SPEED CAR



Dinky Toys No. 23m
A fine scale model of the car in which Capt. G. E. T. Eyston set up a world land speed record of 357.50 m.p.h. at Bonneville, Utah, U.S.A. Price **1/-** each

STREAMLINED RACING CAR

Dinky Toys No. 23s
Similar in type to the "*Thunderbolt*" Speed Car. Assorted colours. Price **1/-** each

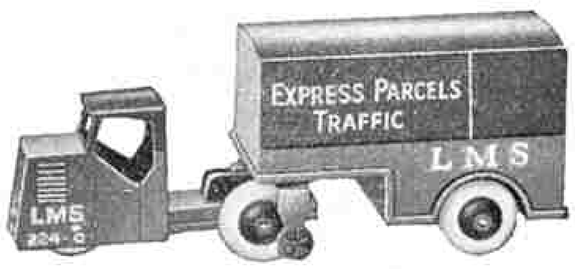
Ready during February.

DIESEL RAIL CAR



Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each
(Made in the Meccano Factory in Paris.)

RAILWAY MECHANICAL HORSE AND TRAILER VAN



Dinky Toys No. 33R
Fitted with detachable rubber tyres.
No. 33Ra Railway Mechanical Horse ... ... each **8d.**
No. 33Rd Trailer Van ... ... „ **10d.**
Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

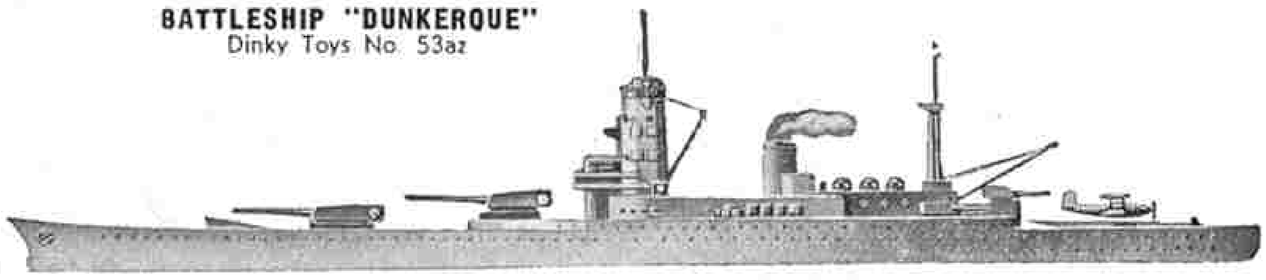
SMALL CARS



Dinky Toys No. 35 Fitted with solid rubber wheels.
No. 35a Saloon Car each **3d.** No. 35b Racer each **3d.**
No. 35c "M.G." Sports Car ... ... „ **3d.**
Price of complete set **9d.**

BATTLESHIP "DUNKERQUE"

Dinky Toys No. 53az



Scale model of the French 26,500 ton Battleship "*Dunkerque*," which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris.)

SIX-WHEELED WAGON



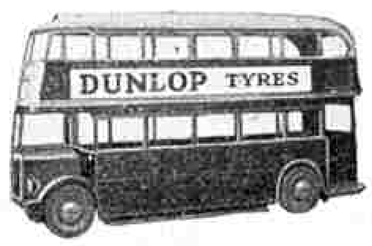
Dinky Toys No. 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER



Dinky Toys No. 36g
Fitted with detachable rubber tyres
Price **11d.** each

DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

POLICE MOTOR CYCLIST

Dinky Toys No. 37b



Price **6d.** each

CIVILIAN MOTOR CYCLIST

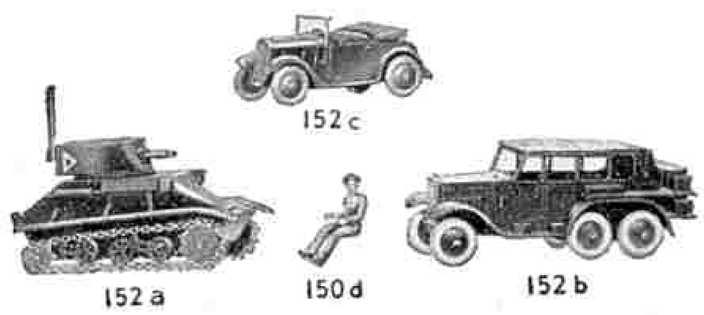
Dinky Toys No. 37a



Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Fitted with solid rubber wheels. Price **6d.** each

ROYAL TANK CORPS LIGHT TANK SET



Dinky Toys No. 152
No. 152a Light Tank (4½ tons, 25 h.p.) ... ... each **1/2**
No. 152b Reconnaissance Car ... „ **1/-**
No. 152c Austin Seven Car ... „ **4d.**
No. 150d Driver ... ... „ **3d.**
Price of complete set **2/9**

AUSTIN SEVEN CAR

Dinky Toys No. 35d

This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each.

POSTAL SET

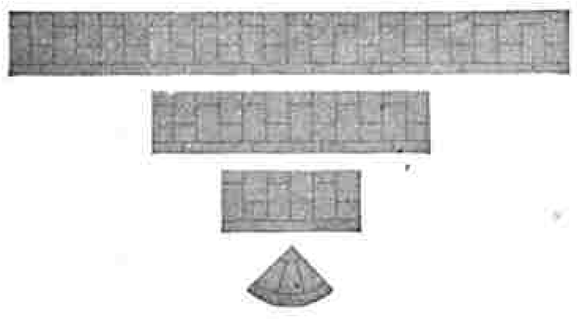


Dinky Toys No. 12

No. 12a	Pillar Box, G.P.O.	each **3d.**
No. 12b	„ „ Air Mail	„ **3d.**
No. 12c	Telephone Call Box	„ **4d.**
No. 12d	Telegraph Messenger	„ **3d.**
No. 12e	Postman	„ **3d.**
No. 34b	Royal Mail Van	„ **10d.**

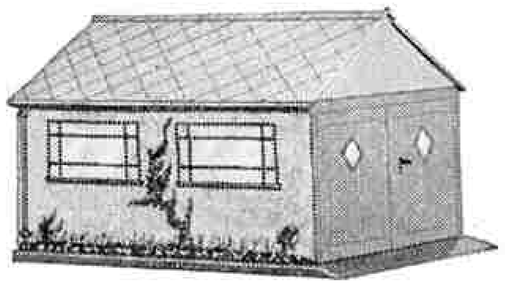
Price of complete set **2/3**

PAVEMENT SET



Dinky Toys No. 46
The contents of this set are four 3 in., six 6 in. and four 12 in. strips of pavement and four quarter discs for corners. Price of complete set **6d.**

GARAGE



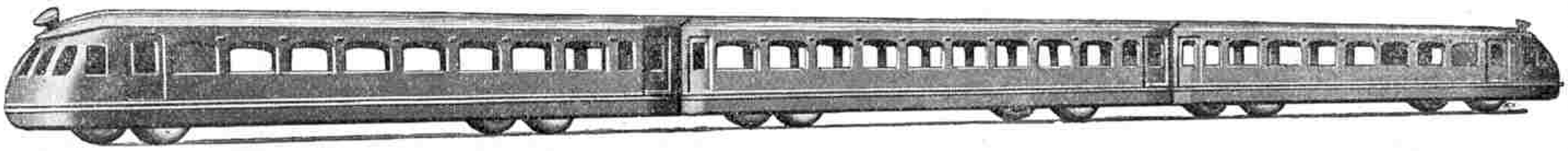
Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars.
Price **1/3** each

THREE-WHEELED DELIVERY VAN



Dinky Toys No. 14z
Fitted with opening lid.
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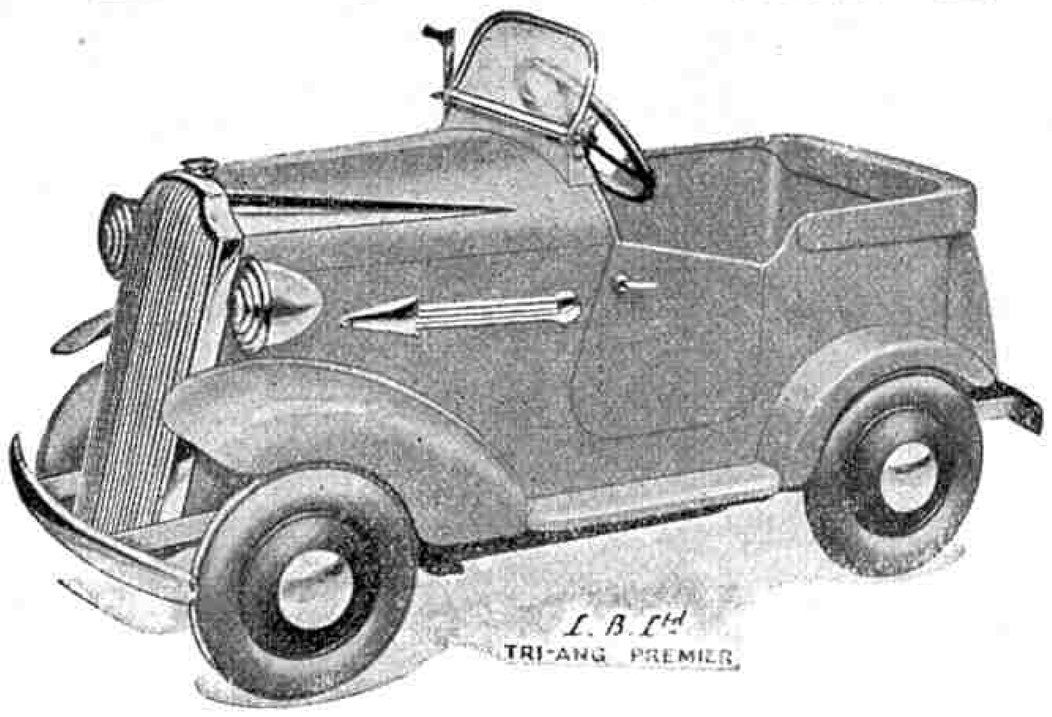
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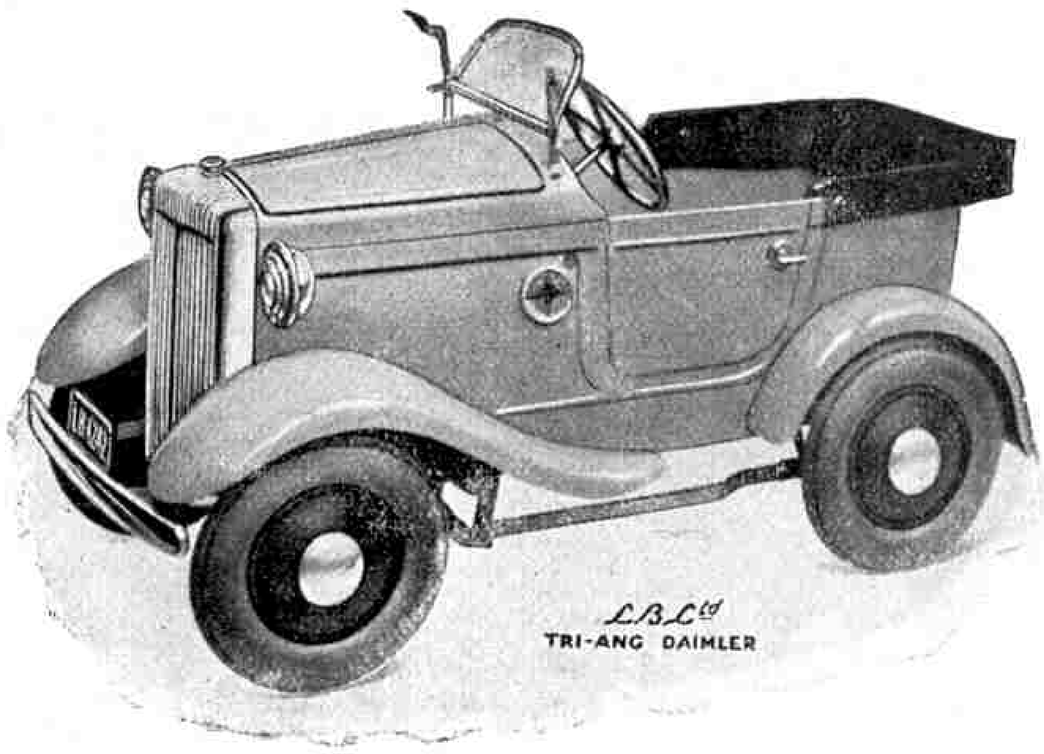
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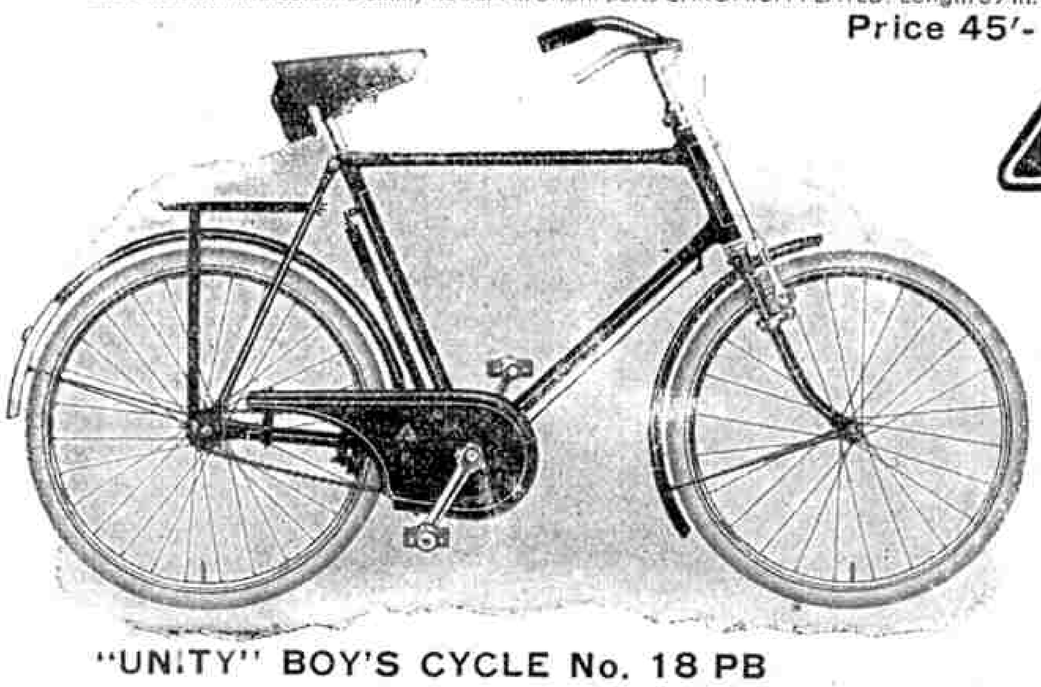
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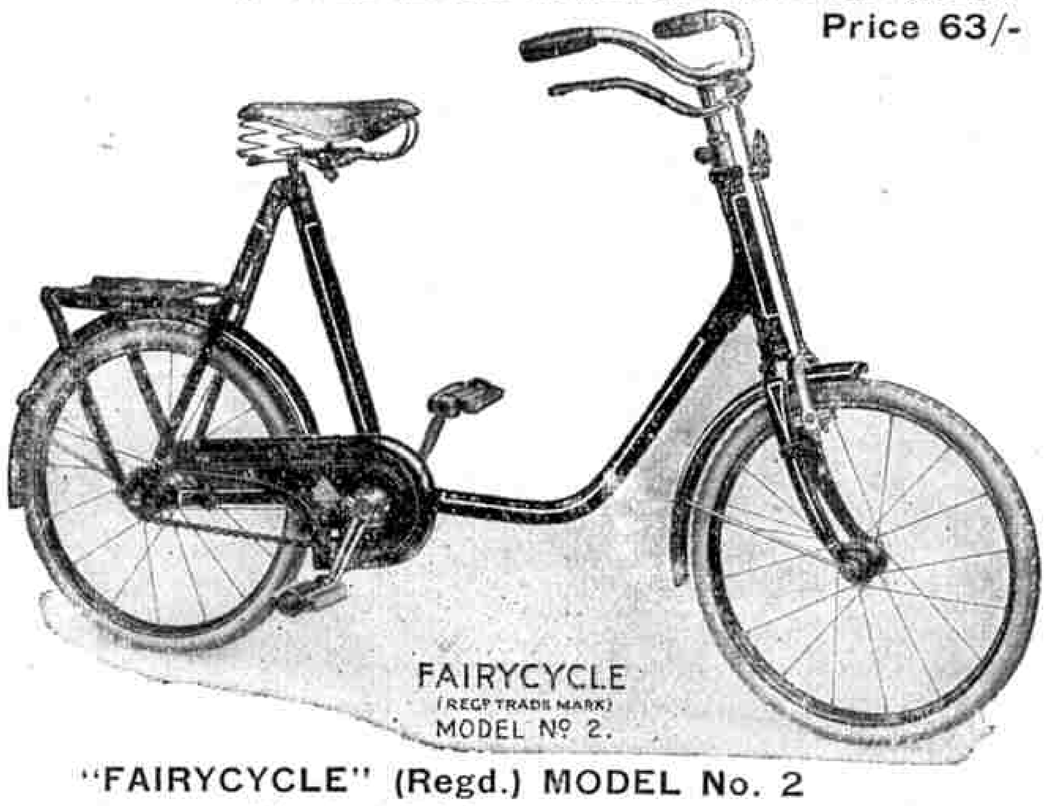
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Tubular frame. 14 in. wheels. 1⅜ in. jointless sponge rubber tyres. Ball-bearing pedals. Rim brake. Two-coil saddle. Chain cover. Stand. CHROMIUM-PLATED FITTINGS Black, blue or maroon.

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MECCANO MAGAZINE

Editorial Office:
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Vol. XXIV. No. 2
February 1939

With the Editor

"Gapers' Gallery"

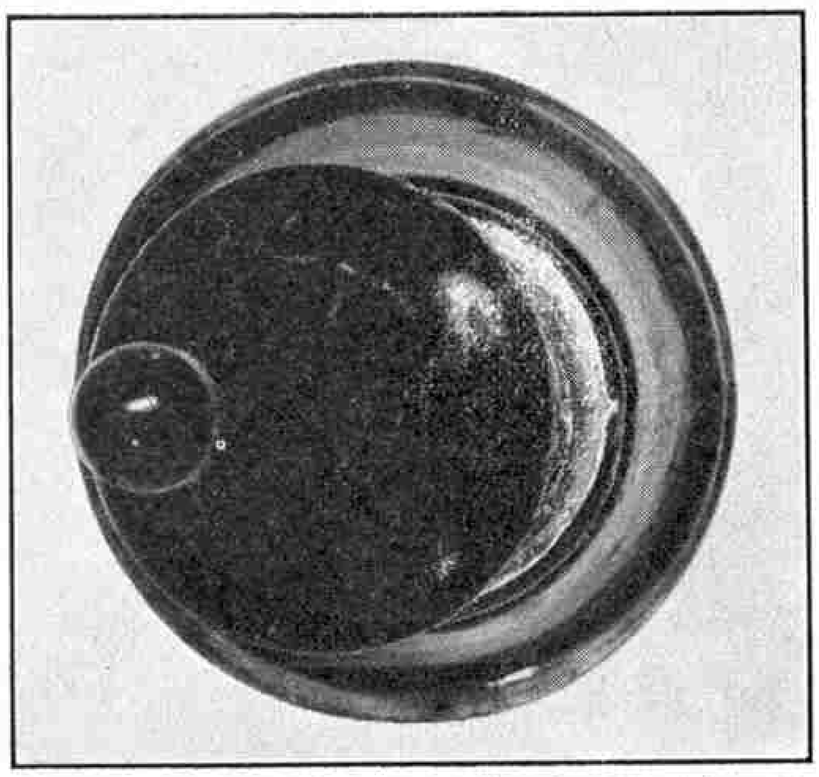
I suppose that most of us are good at watching others work! It is said that Mr. J. D. Rockefeller, the American millionaire, took so much interest in the erection of one of the buildings of the huge Rockefeller Centre in New York that he regularly mingled with the watching crowds. One day he had manœuvred himself into a front position and was just congratulating himself on having a splendid view of the proceedings when a watchman who did not recognise him told him to move on. Mr. Rockefeller meekly obeyed orders, but the incident remained in his mind; and suddenly the idea came to him that it would be a good thing to construct a wooden gallery overlooking the site, from which those who wished could watch the building operations in comfort. This gallery was soon in position and was greatly appreciated. It was labelled *"Sidewalk Superintendents' Club,"* but it also received the more humorous and certainly more expressive name of *"Gapers' Gallery"!* I wonder if such a scheme will ever be adopted in this country?

The "Herzogin Cecilie"

I am sure that many readers would share my regret at the news that the famous sailing ship *"Herzogin Cecilie,"* which had lain wrecked for so long close to the entrance to Salcombe Harbour, Devon, had finally disappeared. This splendid ship had withstood since June 1936 the attacks of the sea with her masts and yards standing. In the end, as was inevitable, the sea won. Some years ago I spent an afternoon on the *"Herzogin Cecilie"* while she was unloading grain at Birkenhead. The Chief Officer, who took me in hand, answered my endless questions with wonderful patience and real enthusiasm for his beautiful ship, and I shall always remember the thrill of that visit.

Next month I hope to include an illustrated article on the career of this great vessel.

MYSTERY PHOTOGRAPH No. 2



Here is the second of our new series of puzzle pictures, in which ordinary things that can be seen every day are shown from unusual angles. I will present a copy of my book "The Modern Book of Engineering" to the sender of the first correct solution that reaches me.

Solutions must be written on postcards only, and addressed "Editorial Competition No. 2," "Meccano Magazine," Binns Road, Liverpool 13.

The Giant Panda Comes West

The article on page 70 of this issue tells the story of *"Su Lin,"* the first giant panda to be brought to America from its home on the border of China and Tibet. *"Su Lin"* was a great attraction during her stay in the Brookfield Zoo, Chicago, and created a panda "craze." The interest of the article is increased by the recent appearance of *"Ming,"* the baby giant panda now at the London Zoo, which has aroused more enthusiasm than any newcomer ever seen there. It is a gentle creature, full of fun, and the latest news is that it has been taught to play football with its keeper.

Other special contributions of great interest in this issue tell us of the home of the gannets on Grassholm, an uninhabited island off the coast of Pembrokeshire, and describe the magnificent L.M.S. *"Coronation Scot"* train that is to represent British railway engineering at the coming World's Fair in New York. Canadian and Empire readers will be particularly interested in the account of the Thousand Islands Bridge, connecting Canada and the United States and celebrating 100 years of peace between the two countries.

Mystery Photograph No. 1

The puzzle picture that appeared on this page last month was greeted with enthusiasm, and there was an avalanche of entries. It proved a greater mystery than I had anticipated. Many readers realised that it was an end view of a reel of string wound on a cardboard core, but most of them overlooked the hexagonal pencil cunningly passed through the centre of the reel, with the point showing. One entrant thought the picture showed a portion of a wicker tea pot cosy; another saw in it an electric torch shining on the ceiling of a darkened room, and several suggested lamps of various kinds. But the majority of competitors who went astray thought the picture represented part of a ship's capstan.

The Story of Su Lin

The World's First Captive Giant Panda

By E. T. Myers

WHAT would your friends say if one day you announced that you were going to China to bring back alive an animal weighing 300 lb. and never before captured? They would probably question your sanity, and you may imagine how the friends of Mrs. Ruth Harkness must have chuckled when she started out on her quest for a giant panda. To make matters seem even darker for her, only five westerners had ever shot such an animal, and few Chinese had ever seen one alive. It is a beautiful black and white bear-like creature. Though far from resembling a "teddy" bear when grown, it certainly does so when young, and its striking appearance is enhanced by large black spectacles around its eyes, as well as by black ears and legs, and a white saddle around its body.

It is not surprising that explorers have been attracted by stories of the giant panda. Many have gone in search of it, but few have returned successful although it is a large animal; and not until 1869 were the first skins of the strange black and white creature brought back to Europe by Father David, a French missionary-explorer. The story runs that Father David had obtained the skins from natives of a western Chinese province. Authorities pounced upon them and, after much deliberation, decided for some reason that the animal was related to the small panda called "fire-fox" by the Chinese. These fairly common animals of southern China and north-eastern India are reddish in colour, with a raccoon-like ringed tail, and can be seen in many zoos. The newly found beast, being much larger, was named "giant panda."

The western province of China, the home of the strange creature, is known as Szechwan, a name that means four rivers, for four great waterways flow from north to south between its mountain ranges to meet the Yangtze-Kiang river. The giant pandas there seem to be a remnant of the animal life of the ice age of thousands of years ago, and the bamboo jungles of their native haunts are so dense that few natives living there have ever seen one. This does not mean that the animal is really rare, though it does live in only that one region of the whole world; what it really shows is that this timid beast pursues a leisurely life silently and alone amidst the bamboo and pines. Probably he ventures from his lair only at night, or during quiet snowfalls, in search of bamboo and roots of plants, his favourite foods. If strangers or wild animals approach, he vanishes as quickly as a wisp of smoke.



Mei Mei, the baby giant panda in the Chicago Zoological Park at Brookfield. The illustrations to this article are reproduced by courtesy of the "Chicago Tribune."

Theodore and Kermit Roosevelt, cousins of President Roosevelt, planned an expedition into Eastern Asia in search of the giant panda. As they were afraid of ridicule, they spoke of other aims, such as the capture of golden-haired monkeys. Starting from rangoon, in Burma, their well-equipped party passed through much difficult territory before reaching Szechwan, and on reaching Father David's country they began their search. Careful questioning revealed that several natives had shot giant pandas years earlier, and the Roosevelts then succeeded in buying some skins. Their main objective was to shoot a giant panda themselves, however, together if possible, but days of tracking through the dense bamboo, where they could see scarcely 20 ft. ahead, failed to reveal the animal. On occasion bits of white fur were found on hollow logs or tree trunks, where the animal had been stretching or scratching the bark, and these served to renew hope.

One night it snowed and the next day, when hunting was renewed, Theodore and Kermit spotted giant panda tracks. Following these, they noticed that their prey was continuing a leisurely course not very many hours ahead. Chewed and broken bamboo sticks were noted all along, and on coming into a small clearing the hunters saw a huge black and white panda emerging from the bole-hollow of a tree. Obviously too sleepy to be aware of his danger, the animal lumbered off into the jungle, and both Roosevelts fired simultaneously, felling the beast.

Although that night there was a great celebration in the Lolo village, superstition hung about the "beishun," a name meaning white bear that the natives use, and the inhabitants of the region feared to have the animal brought into the village compound. In fact, a religious ritual was afterwards necessary to purify the places where the panda carcase had been kept. Triumphant the Roosevelts returned home with the giant panda skins as well as the hides of many other rare animals and birds, and these were mounted and placed in native groups at the Field Museum of Natural History in Chicago.

In the years following this episode, three more explorers shot giant pandas, and one brought back the carcase for study. Zoos desired to have a living example, however, for it was probably the most interesting animal not yet in

captivity, and Mrs. Harkness set out for the interior of China, determined to be the first person to bring one back alive. It was a perilous venture for a woman. No explorers had captured a giant panda, and few had shot one. Their experiences were a little helpful, however, for they indicated that the pandas do not hibernate in winter, as do their relatives the bears and the raccoons, so that the season when snow is on the ground is the best in which to track the beasts to their lairs. The animals are large, and the possibility of transporting one weighing 300-lb. on the miles of marching necessary to reach the coast was not appealing. It was hoped that a baby giant panda could be found, for the young are born in early winter, and with this in mind, a supply of powdered milk and a baby's bottle were taken along.



Su Lin, the first giant panda seen in captivity. Her resemblance to a teddy bear and her quaint and playful ways made her a universal favourite and started a giant panda craze in the United States.

With a Chinese born in the United States as guide, Mrs. Harkness quickly reached giant panda country, and one day, when on a march from the base camp, not far from the Roosevelt territory, native hunters spotted a large panda. In their excitement, mingled probably with fear, they frightened it by shooting, but when the commotion had died down the whimpering of a baby animal could be heard coming from a hollow tree. Mrs. Harkness had found her panda!

The baby proved to be very young, weighing little more than 2 lb. Fast marching was made to the base camp, where the powdered milk and nursing bottle remained, and then warm milk every few hours kept the little creature contented. She was named Su Lin, which in Chinese means "*Precious Little Darling.*" As yet her eyes were not opened, and she didn't seem to mind the travelling.

On reaching the nearest city, an aeroplane was boarded for Shanghai. Once situated in a comfortable hotel, Mrs. Harkness was better able to care for Su Lin, who was growing very rapidly. Fortunate it was that a woman had found the little panda, which needed as much care as a human baby. She had to be kept warm, though the air in her bedroom had to be cool like the breezes of her homeland; and she got lonesome very easily and needed much pampering. All looked well now, but in spite of the care lavished upon her Su Lin was suddenly taken ill. In the middle of the night, desperate with fear, the huntress called a doctor, a baby specialist, who took such an interest in the little black and white animal that he prepared a special diet for her. This included cod liver oil and seemed to do the trick, for Su Lin was soon well and comfortable again.



Su Lin amusing herself with a chair at the Brookfield Zoo.

Public interest was intense, not only because a rare animal had been brought back alive for the first time, but because the little animal was so "cute"—a ball of black and white fur with big black circles around its now open eyes. After some Customs delay Mrs. Harkness sailed with her baby panda, and when the boat docked in San Francisco newspaper reporters rushed to the docks for an interview, while the flashlights and excitement worried the good little sailor Su Lin a lot. Air lines vied with each other to be the first to fly a giant panda across the United States. Su Lin took a fast train, however, travelling in a quiet air-conditioned compartment. Crowds again met her in Chicago and New York, and she was invited to banquets and had many callers, including the Roosevelts and other panda hunters.

Ruth Harkness hated the idea of selling Su Lin, but the baby was growing and would soon become too large to keep in a flat, and her owner wished to finance a new panda expedition. Though the zoos really desired the little animal, they feared she could not survive in such a climate and with food so different from that of her homeland. Finally a Chicago zoo offered to "board" her, and ultimately bought her, in spite of the risk that the baby animal would not live. After all, Su Lin couldn't just drink milk and cod-liver oil all her life. However, she didn't seem particular, soon eating everything within reach, apples, rice, the usual breakfast foods, cornstalks, alfalfa grass, and on special occasions grapes.

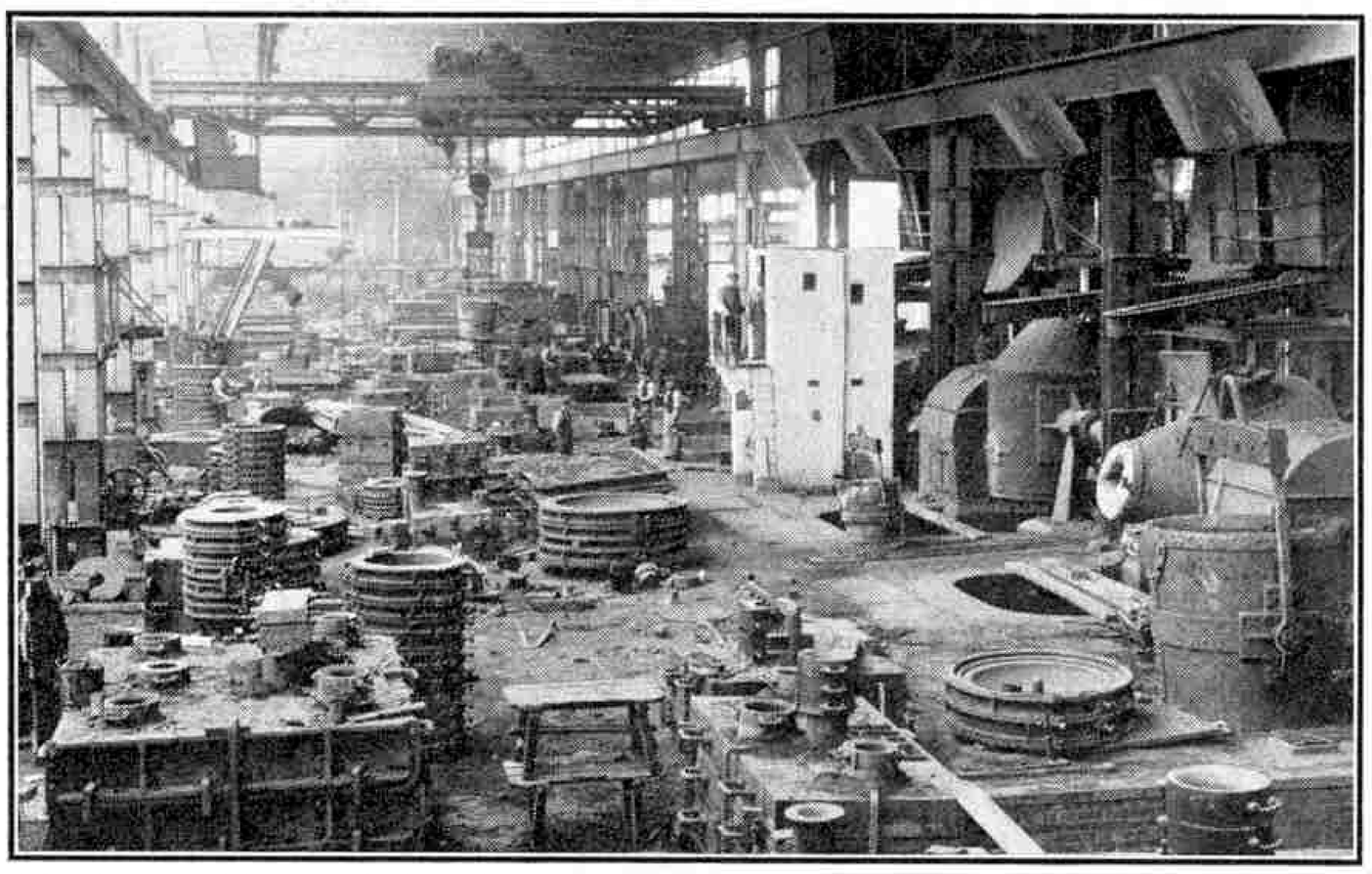
At the zoo Su Lin immediately became queen of the animal kingdom. She had a nurse to watch her health and every attention was showered upon her. Thousands of men, women, and children from miles around came to Chicago to see her, and attendances rose so rapidly that Su Lin paid for herself in a short time. Meanwhile Mrs. Harkness prepared for a second expedition into China. With the war raging, difficulties were greater, but by entering from the south she was able to reach the giant panda province, and she obtained a second female baby, called Mei Mei, which was brought to the zoo in February of last year to act as a companion to Su Lin. Unfortunately in April Su Lin became ill, and the world was shocked to learn of her death, apparently from a bronchial ailment. Mei Mei, the world's second giant panda in captivity, is not as sweet tempered as was Su Lin, but delights visitors by her antics.

Fireworks in the Foundry

Making Steel in the Tropenas Converter

OUR cover illustration this month shows a special converter for the production of steel in relatively small quantities, in action in the foundry of Edgar Allen and Co. Limited, Sheffield. This converter was originally designed by Alexandré Tropenas, a French pioneer of steel making, and was perfected in the works of Edgar Allen and Co. Limited.

The Tropenas method of making steel is fundamentally the same as that devised by Sir Henry Bessemer, who turned from other inventions to the making of steel at the time of the Crimean War, in which the artillery of the British Army proved to be inadequate. While striving to produce a metal that would stand the strain imposed upon it in firing, a chance discovery led him to devise a furnace in which air under pressure is blown through molten pig iron to convert it into steel. The purpose of the blast is to burn out or oxidise such impurities as silicon, manganese and carbon in the charge, which is not heated by means of fuel, but is fed in molten and kept at the right temperature by the intense heat generated by chemical changes that the blast of air brings about. Manganese is then added to remove excess of oxygen from the metal, which would cause blowholes; and the required amount of carbon is introduced by suitable additions.



A bay in the steel foundry of Edgar Allen and Co. Ltd. On the right is the Tropenas converter plant described in this article and shown on our cover. Photograph by courtesy of Edgar Allen and Co. Ltd., Sheffield.

This comparatively simple process was received with derision by some steel makers, and their lack of faith in Bessemer seemed to be justified when those who set up converters failed to produce good steel. Bessemer set to work to improve his process and, acting on a suggestion of Mushet, a Scottish pioneer of the iron and steel industry, soon succeeded in placing on the market high grade steel at £20 per ton less than that of his rivals.

The original form of the Bessemer converter was lined with ganister, a kind of hard sandstone, and steel-making in it came to be known as the acid process because of the chemical character of this material. The much smaller Tropenas converter is of the acid type. It originated in experiments by a pioneer of the name of Robert, who set the tuyeres, or tubes through which the air blast is forced, below the surface of the molten metal, and at a tangent to its surface. The stirring movement that followed was thought to give more rapid and complete purification of the pig iron.

Tropenas tried the Robert converter for producing steel on a small scale, but found it unsatisfactory. The working would be excellent through two or three "blows," as each operation was known, and then in others the steel would not become hot enough to flow freely into the sand moulds. After experimenting for a year or so Tropenas became convinced that success with the small converter could only be achieved by blowing across the surface of the metal. This was in 1890, and a year later he began work with a converter built in Sheffield under his own supervision. There were still many disappointments for him, but eventually all difficulties were overcome, and within a few years converters of the Tropenas type had been installed at the Royal Arsenal, Woolwich, and in other foundries in Great Britain. Today the process is used in most parts of the world where steel castings are produced. Before it was introduced the manufacture of steel castings for electrical purposes was practically impossible on a commercial basis, and wrought iron was largely used.

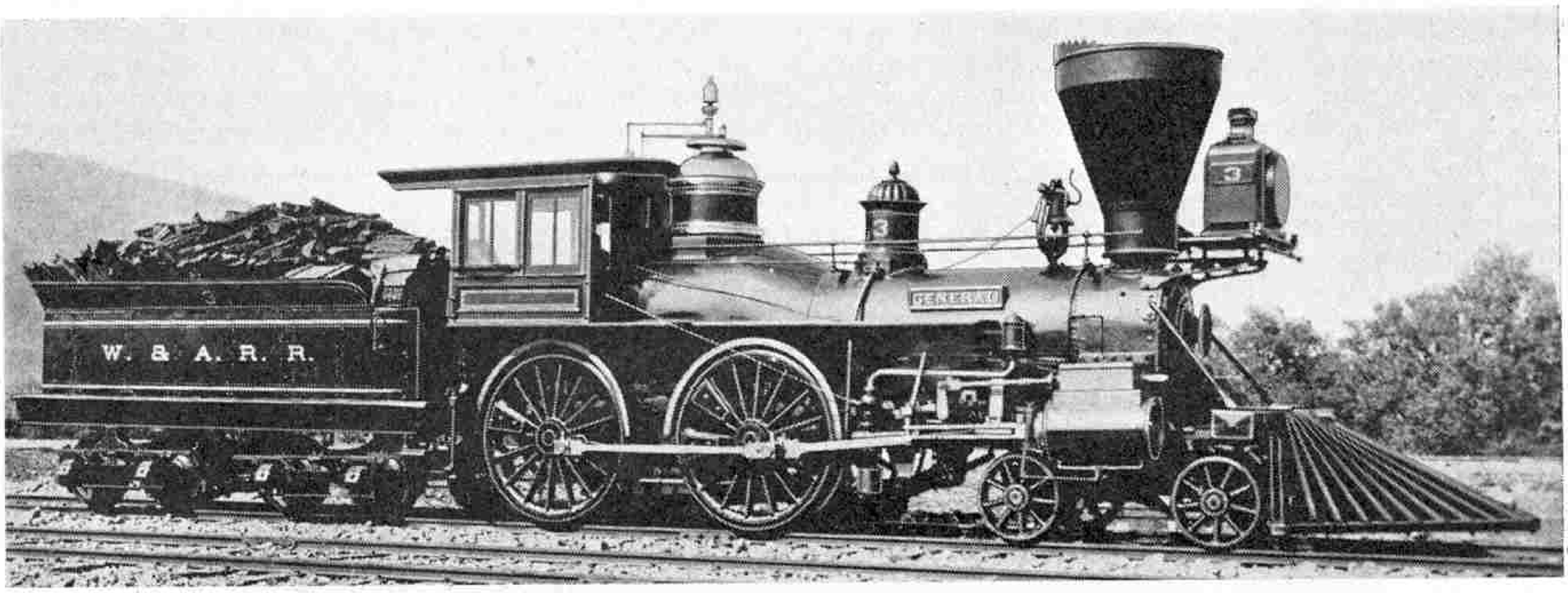
In his converter Tropenas used a deep bath of molten metal with two rows of tuyeres placed in straight lines at one side of the converter, one row above the other. The air blast was directed across the surface of the metal so that the oxidation that purified the pig iron was effected only there. The lower set of tuyeres actually was used to direct the air blast on the surface, the purpose of the upper set being to furnish the air for burning the gases produced and thus increasing the temperature. In practice it was found that the upper tuyeres became rapidly stopped up by slag, and now it is usual to dispense with their use.

As our cover suggests, a "blow" with this converter is a brilliant spectacle. The flame issuing from the open mouth is at first short, and not very brilliant. Silicon and manganese are then being burned out, but when the air blast attacks the carbon a gas is formed that bursts its way through the slag covering the molten metal and burns with a long and brilliant flame, accompanied by a cascade of white hot slag particles or sparks that make up a magnificent firework display. Steel makers call this "the boil." The blast of air is stopped as soon as this flame drops, for this means that the carbon has been almost completely oxidised. To stop the blast too soon or to allow it to continue for even as little as 15 seconds too long would spoil the steel.

Historic Locomotives

II. The American Civil War Engine *"General"*

By C. Hamilton Ellis



THE locomotive *"General,"* shown in the illustration above, was built by the Rogers Locomotive Works in 1855 for the Western and Atlantic Railroad, U.S.A. This engine, which became historic by reason of an astonishing adventure through which it went, was a 4–4–0 locomotive with the wood-burning furnace and "balloon" smoke-stack of the period, and was typically American in design and appearance.

During the American Civil War between Northern and Southern States, the Western and Atlantic main line between Atlanta and Chattanooga was a vital route to the Southerners or Confederates, and therefore was considered specially worthy of destruction by the Federals, as the Northern men were called. To this end Captain James Andrews of the Federal Army and a picked company of 21 men managed to make their way in disguise far down behind the Confederate lines. Their object was to capture a train, and use it for a grand destructive tour of the Western and Atlantic. This was on 12th April 1862, and the train they picked on happened to be the 6.0 a.m. from Atlanta to Chattanooga, drawn by the 4–4–0 *"General."* This train, under the care of Confederate Captain W. A. Fuller, stopped at Big Shanty, some way out from Atlanta, for the breakfast interval. During breakfast Captain Fuller suddenly saw 22 of his supposed passengers rush the engine and calmly drive her away northward, taking with them three empty box cars that were next to the tender, and leaving the passenger cars standing in the station.

Fuller, with Engineer Cain and Shop-Foreman Murphy, set off in pursuit, on foot over the sleepers. After running for two miles they met a party of surfacemen, who said that the train had stopped, and that those aboard had relieved them of their appliances and cut the telegraph wires before going on again. Fuller, Cain and Murphy then plodded on with the surfacemen's hand-car and reached Etowah, some miles away. At Etowah they commandeered an industrial locomotive named *"Yonah,"* and took in tow a coal car with a company of Confederate soldiers. The wheezing old *"Yonah"* took them as far as Kingston, where the line was blocked by an accumulation of freight cars.

Now Andrews' proceeding was a tremendous game of bluff. To prevent pursuit or interception he stopped the *"General"* periodically, blocked or destroyed a length of track, and cut the telegraph wires. At wayside stations, officials and soldiers were told that this was a special train conveying munitions to the Confederate General Beauregard, and the bluff succeeded!

Fuller was determined to recover his train, however, and also to prevent Andrews from having time enough to do any major damage. The turning of the tables began when he came up to the freight engine *"Texas,"* which he detached from its train and pressed into the pursuit, running tender first. He came within sight of the purloined *"General"* just as Andrews and his company were giving some further attention to the telegraph wires.

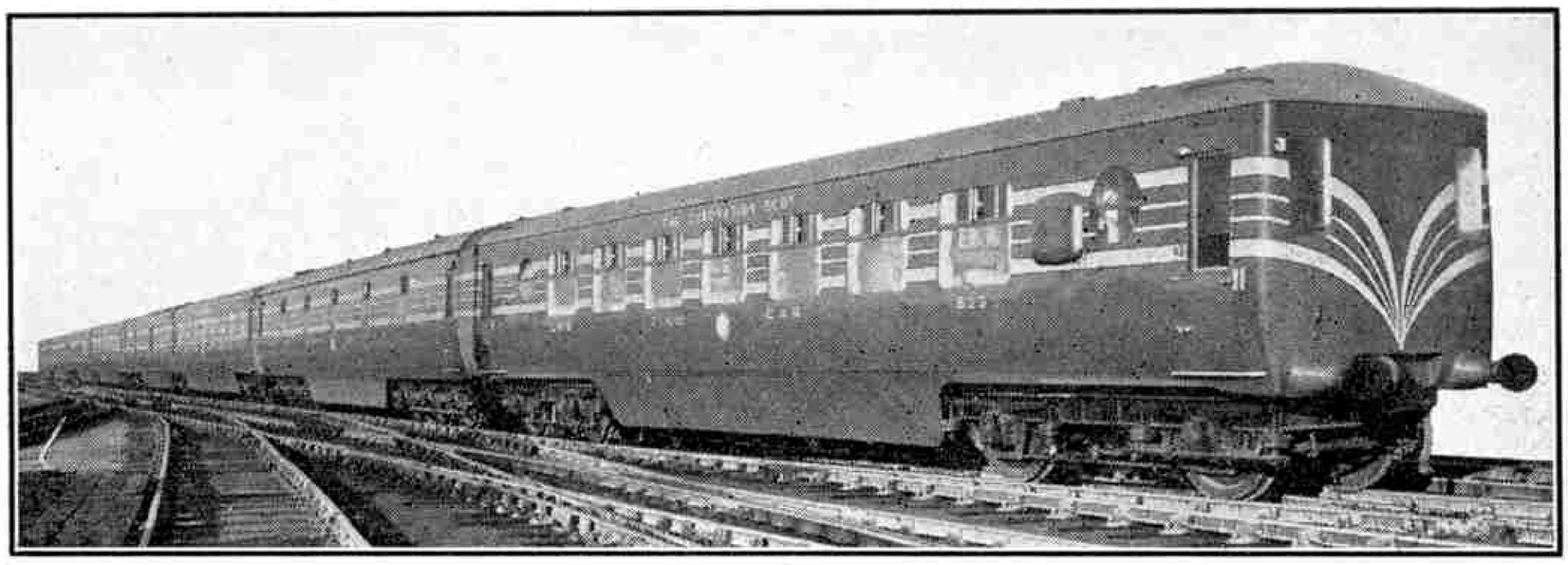
Andrews and his men mounted the *"General"* and set off in a hurry, leaving one of their freight cars in Fuller's way. Twice they did this, and both times the *"Texas"* picked up the car and pushed it ahead of their tender. This close pursuit went on for many miles, in the course of which Fuller was able to shunt the encumbering cars into a siding. Andrews, in his turn, had knocked out the end of his remaining car, the better to throw out obstructions while running. Again and again Fuller caught him up, however, and at last he was obliged, through failing water and fuel, to abandon the *"General."* His men set their car on fire and reversed the engine, but in their hurry they forgot to release the handbrakes, and the intended collision failed to take place. They were all captured, and Andrews and several of his companions were executed. Thus was the *"General"* recovered, after a chase covering something like 90 miles.

The illustration above shows the 4-4-0 locomotive "General" that was involved in the exciting incident in the American Civil War described on this page. The engine was built in 1855, and was a typical example of the 4-4-0 or "American" wheel arrangement of the time. It is now preserved at the Union Station, Chattanooga. Photograph by courtesy of the Nashville, Chattanooga and St. Louis Railroad.

"The Coronation Scot's" Visit to United States

Special Features of the New Train

ON page 74 of this issue are given brief particulars of the preparation, shipment and general programme of the visit to the United States of "*The Coronation Scot*" of the L.M.S. In this article we review some of the more outstanding features of the new train, which is representative of the very latest British railway practice.



A view from the rear of "The Coronation Scot" train visiting the United States. The club car at the tail and the vehicle next to it, which is a sleeping car, are separate coaches, but the remainder of the train is made up of twin-articulated units. The photographs to this article are reproduced by courtesy of the L.M.S.

It says much for the present day efficiency of transport that such an undertaking as the shipment intact of a complete express train half-way round the world can be planned and carried through without a hitch. Older readers will remember that in 1927 a G.W.R. locomotive, "*King George V*," was shipped across to the United States to represent its owners at the "Fair of the Iron Horse," celebrated in that year by the Baltimore and Ohio Railroad. The appearance and finish of the engine created a sensation, and its performance on a special run over there was sufficient evidence of the efficiency of the products of Swindon.

In 1933 occurred a more ambitious project in the shipment of a representative "*Royal Scot*" train and the well-known engine of that name, L.M.S. No. 6100, in connection with the World's Fair held in that year at Chicago. In the course of this visit the train made a comprehensive tour of various American and Canadian railroad systems in the course of which over 11,000 miles were covered without a single mechanical breakdown. A visit to the United States is therefore no new thing for an L.M.S. train.



Inside the first-class lounge car. The spacious effect obtained within the limited dimensions of a railway vehicle is very marked.

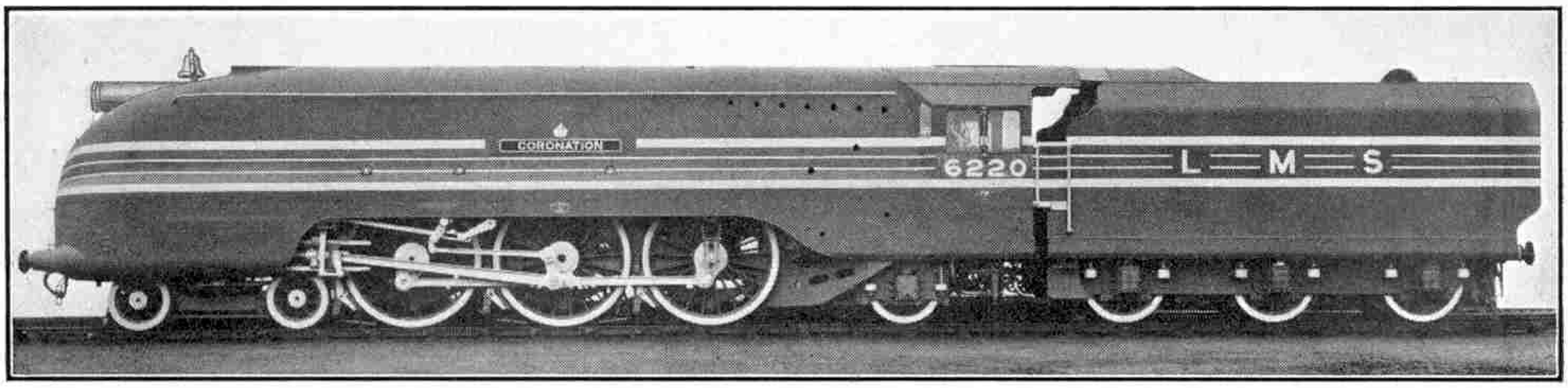
The present-day "*Coronation Scot*" exhibits the remarkable progress in design and in comfort that has occurred since "*The Royal Scot*" started out as a mechanical ambassador six years ago. Streamlined trains were then unknown in this country; the modern high-speed limited express providing special accommodation for a particular service had not arrived; and railway trains then, apart from the increase in size, presented much the same appearance as they had done for many years.

This latest "*Coronation Scot*" is streamlined throughout, however. Its engine has a rudimentary chimney as practically the only projection from its external casing, and its stock, sleek from end to end, with the minimum of "works" visible, is decorated externally with continuous gold bands running from tip to tail and emphasising the unbroken appearance of the whole train. This train represents an advance over anything at present in use on the L.M.S., for it is one of three set trains laid down for introduction in the "*Coronation Scot*" service in 1940. Its construction has been pushed forward specially in view of the American visit.

The engine selected to haul the train is appropriately enough No. 6220 "*Coronation*," the first of the series of streamlined 4–6–2s developed specially for the "*Coronation Scot*" service. It is the engine which, on a special trial run, touched a maximum speed of 114 m.p.h., the highest speed authentically recorded on the L.M.S. It has four cylinders, and under its streamlined casing is a very large boiler with a capacious fire-box. The total heating surface amounts to 2,807.5 sq. ft., exclusive of the superheater surface, which is 856 sq. ft. The grate area is 50 sq. ft.

It is interesting to compare the style of streamlined casing adopted on this locomotive with that employed on the various American streamlined designs. Unlike the majority of United States locomotives, which are provided with mechanical stokers, "*Coronation*" is hand-fired, but has an interesting auxiliary that reduces the work of the fireman to some extent. This device is a steam-operated pusher mounted on the back of the coal bunker in the tender, which is used to feed coal forward from the rear towards the end of a run, when the supply at the shovelling plate is getting low.

A certain amount of special equipment has been necessary for the visit of the engine to the United States.



L.M.S. streamlined 4-6-2 locomotive No. 6220 "Coronation." For running in the United States with "The Coronation Scot" train the headlight and bell, which are prominent in the illustration, have had to be fitted. This engine was the first of the L.M.S. streamlined 4-6-2s.

A headlight and bell have been fitted, and these can be seen in the illustration at the top of this page. Side floodlights too are provided, together with a spark arrester and automatic couplers. Another feature in which American practice has perhaps not been without its influence is in the use of the hooter type of whistle that is fitted to all the most recent standard L.M.S. locomotives. The distinctive note of this is like that of a ship's siren, and should appeal to the Americans, accustomed to the deep-toned hooters of their own locomotives, who were surprised and amused by the shrill note of the whistle carried by "*Royal Scot*."

The train itself consists of eight vehicles made up of three two-coach articulated sets and two independent vehicles. Starting from the front end, the first articulated set consists of a brake-first and a first-class corridor coach. The second set consists of a first-class lounge car and a first-class dining car. Then come the kitchen car and third-class dining car, articulated to form one unit. The next vehicle is a first-class sleeping car. Sleeping cars do not run on "*The Coronation Scot*" in normal service, but this sleeper has been included in the formation to demonstrate how first-class travellers by night are catered for in this country. Finally there is a club saloon which, like the sleeping car, is an independent vehicle.

Steel has been used to a considerable extent in the construction of these vehicles and welding has been largely employed in their assembly. Teak body pillars are bolted in position in sockets welded to the solebars and cant rails, and to these pillars are screwed the steel body panels, which are welded together in units, each extending from one door to the next, and to the cant rails. The roof panels are of steel and these too are secured in position by welding.

The bogies are welded throughout in accordance with the latest L.M.S. standard practice. The outer ends of the articulated units are provided with the standard draw and buffing gear, but the inner ends are fitted with the Gresley type of articulated coupling used on the L.N.E.R. The two independent vehicles, the sleeping car and the club car, conform with standard L.M.S. practice in these respects.



The interior of the club car of "The Coronation Scot." This is furnished and upholstered to give an effect of restful comfort.

Exterior projections have been reduced to a minimum throughout. The body panels are flush with the windows and between the bogies sheet metal valances are fitted that come within 12 in. of the rail level. In order to preserve continuity of line the space between the adjoining ends of each pair of vehicles is closed with special rubber sheeting. This is stretched into position so that the exterior of the train presents a uniform and practically unbroken appearance throughout its length.

Although the special colour adopted for the "*Coronation Scot*" trains at present in service is blue with silver bands, this train is finished in the standard L.M.S. dark red. There are four gold bands running the full length of the train, as shown in the upper photograph on the opposite page. These bands continue round the shaped ends of the brake compartments and finish in a V-shaped point in the centre.

It is interesting to note that with the exception of the sleeping car, which as previously explained is not truly a "*Coronation Scot*" component, the vehicles of the new train are of light construction. The employment of articulation and the use of welding in the assembly has made it possible to reduce weight appreciably in comparison with that of a similar train of vehicles of regular construction, and the new train when empty weighs only 262 tons 10 cwt. instead of the 289 tons 13 cwt. of a similar standard train. There are 173 seats and 12 sleeping berths.

The interior decoration of the train is carried out on the most modern lines. A flush finish is obtained in the compartments of the first-class corridor coaches by the use of veneered panels. A variety of Empire timbers is used, and each compartment is finished in a different manner. In the dining cars a novel effect has been obtained by lining the walls and partitions with leather on a felt foundation. The seats also are upholstered in leather with loose cushions. The sliding doors in these vehicles are faced with Bakelite.

In the lounge car there are some new features in railway carriage interior design. The walls do not follow the contours of the body sides, but are made to provide a flat vertical side with wide window sills. Both walls and partitions are covered with blue leather and panelled with chromium plated mouldings.

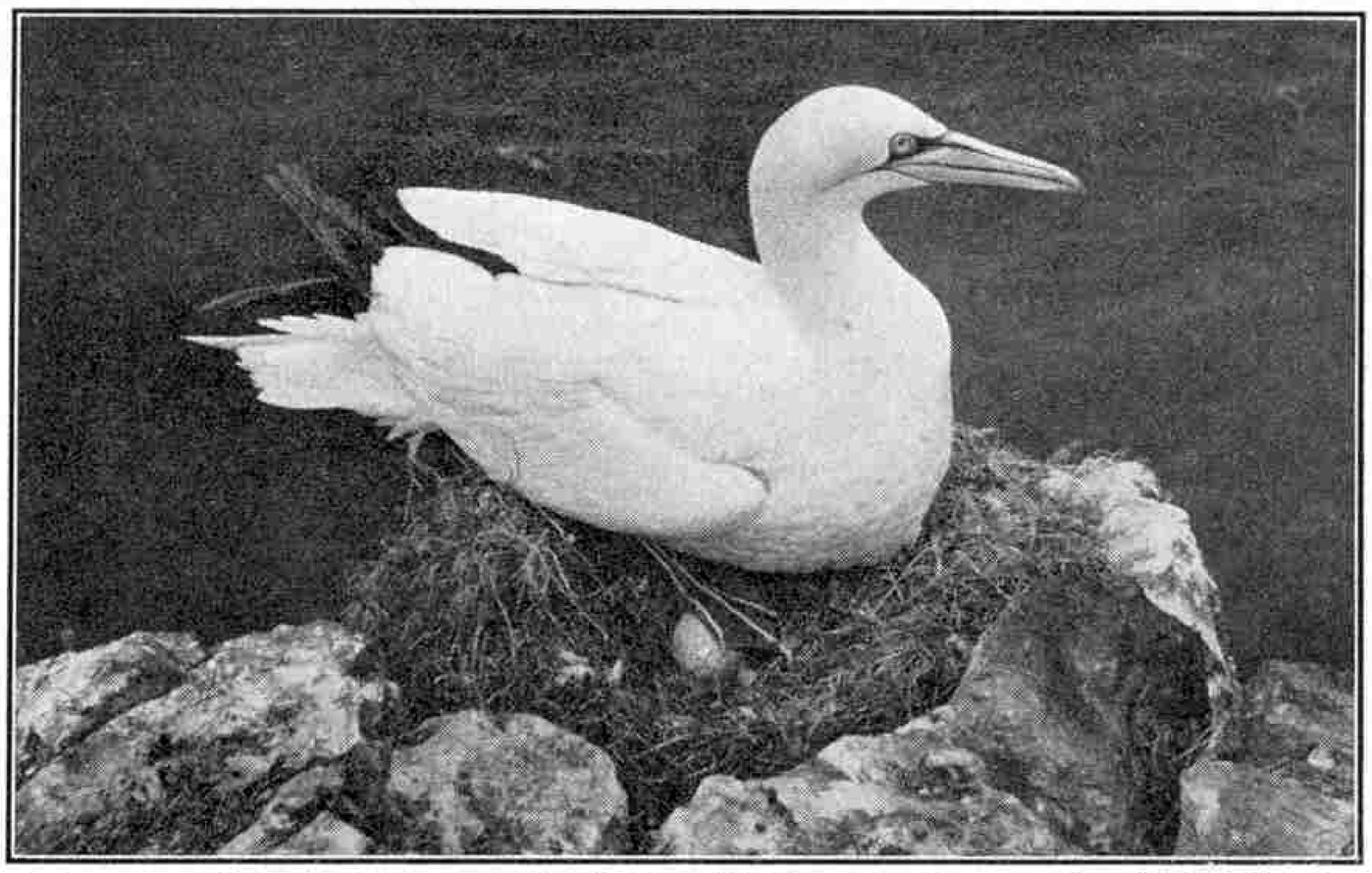
Grassholm—The Island of Gannets

A Crowded British Rookery

By H. Auger

IN the March 1930 issue of the "*M.M.*" there appeared a description of a wonderful gannet rookery situated at Cape Kidnappers, New Zealand. A no less remarkable colony of gannets, the only one in England and Wales, is to be found on Grassholm, a 20-acre rock that lies about 16 miles S.W. of St. Davids, Pembrokeshire; and the number of gannets nesting there is so great that the northern half of the island appears white when seen from the cliffs at St. Davids.

Access to the island is obtained by a small motor or sailing boat. The trip can be made only when the sea is exceptionally calm. The St. Davids coastline is very rugged, and there are fine views of the high cliffs of Ramsey Island and the wave-dashed rocks of the Bishop and Clerks. Grassholm begins to take shape after an hour's sailing, and the sea birds swimming and diving round the boat increase in numbers, those that fail to take wing diving out of sight when the boat is almost upon them. Flocks of puffins and strings of razorbills are observed making for the islands nearer the mainland on which they nest. Occasionally a gannet flies across the boat on the journey to or from the fishing grounds, and several too may be seen riding lightly on the waves, with necks erect, like buoyant swans.



A gannet protecting her egg by grasping it with her webbed foot. At a later stage the chick is held in the same manner when intruders approach a nest.

When about a quarter of a mile from the island, the swarming cloud of gannets over the colony somewhat prepares the visitor for the amazing sight he is to enjoy on landing. The boat is manœuvred round the numerous reefs into a small creek about 15 ft. wide, where, until the boat approaches, numerous grey seals are to be seen basking on the rocks. On leaping out on to the rocks there is only one thing to do. This is to climb the ridge straight in front of the creek, and on topping it the whole mass of gannets flashes into view. There are thousand upon thousand of them in all life's stages, eggs, day-old skinny chicks, large fluffy young, mottled year-old birds, brooding birds, birds feeding young, and others alighting and taking off, and added to the great crowd on the nesting surface are more gannets sailing over the island in a confusing cloud of such numbers as to make the observer dizzy.

The colony lies on the side of the rock opposite to the approach and the even spacing of the nests immediately gives one an impression of a neat and well-planned scheme. Rarely is a nest seen untended by one of the parents. This even covering of the nesting area has been caused by the gradual expansion of the colony from the cliff edge backwards.

Descending the north side of the island it is possible to walk among the sitting birds, providing one moves stealthily, so that closer observation may be made. The gannet then is seen to be a beautiful bird, possessing a billowy white body, with wings tipped with black, and the crown of the head and back of the neck with yellow. The long spear of a bill and the legs and feet are of a slate colour, the toes being outlined with green. The only time a gannet appears to lose its beauty is when viewed face to face; then its eyes, set in a patch of skin at the base of the bill, appear to have a rather bad squint that is very amusing.

The nest is a large mound of sea-weed, feathers and vegetable matter found floating on the sea, hollowed out in the centre to receive the single egg, where it is brooded for six weeks. The egg is regular in shape and is pale blue in colour, but is usually covered with a chalky deposit that gives it the appearance of being white. The stains of rotting sea-weed and the continual paddling of the parents' feet turn this whiteness to dark brown as incubation proceeds.

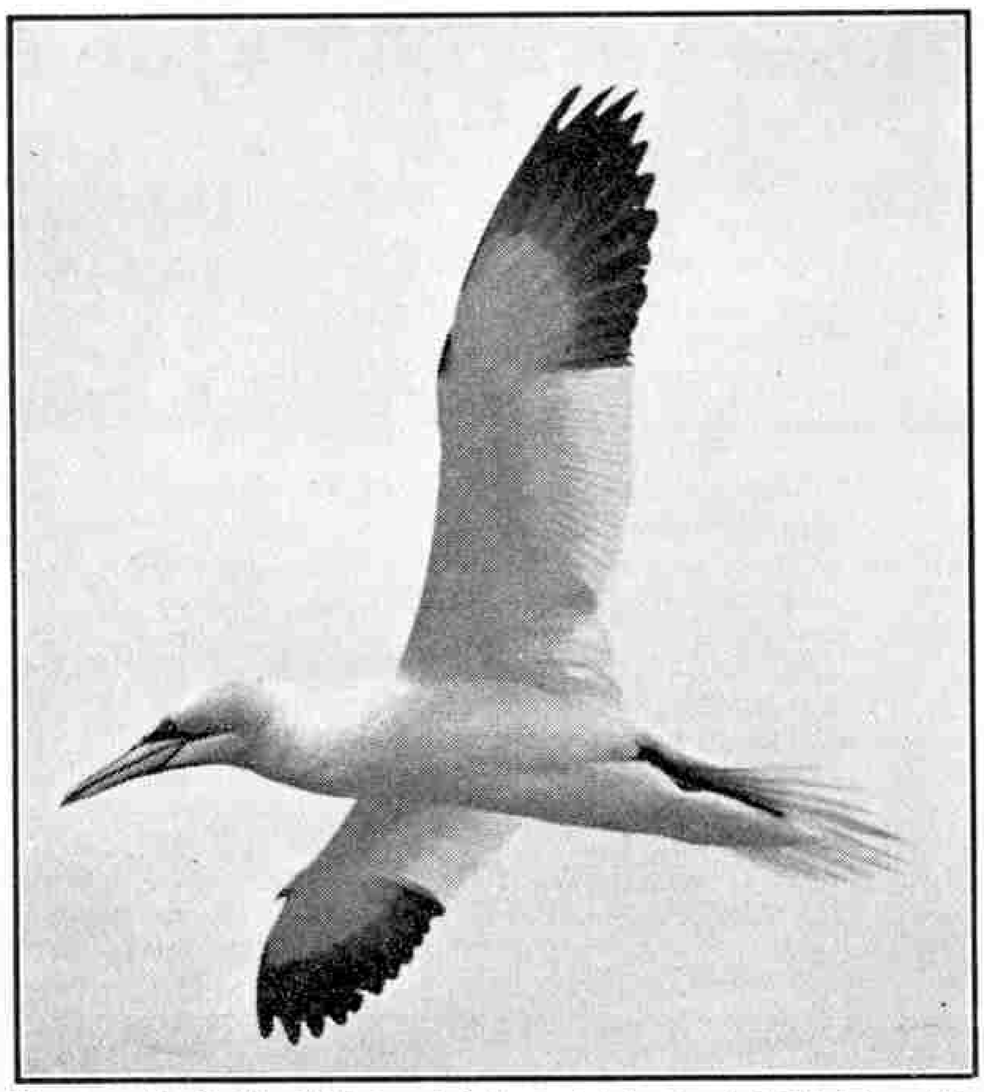
After the adult birds have been fully admired, attention is next drawn to the young. These are of all sizes, from chicks covered by a dusky skin, just emerging from their shells, to nearly full-size young ready to fly. Other nests contain eggs in various stages of incubation, as is obvious from the colour of the shell.

When one approaches a nest with the parent bird at home, the gannet rises in protest and stretches its bill forward to give a harsh bark. At the same time it places one of its large webbed feet on the egg or chick, in the manner of a dog defending a bone. In the case of a young chick, one is struck by the apparent cruelty of this method of protection, considering that the gannet is the size of a tame goose. The chick, letting forth feeble cheeps, is plainly supporting a lot of the parent's weight, but the grasp is not released until the intruder moves away.

Occasionally a gannet takes flight on being closely approached, crashing its way towards the cliff edge in an

attempt to escape, as it is impossible for it to take off on the crowded slopes. Such a move as this causes a great disturbance, as all the gannets in the track of the escaping bird are thrashed by its wings, and in return thrust out their large bills. At the same time all the birds in the vicinity start to cackle. In the end the frightened bird tumbles over the edge of the cliff to freedom. After watching the above performance, it is difficult to decide which birds have chosen the best situation for their nests. Those at the cliff edge are continually being buffetted by birds desiring to take off, while birds that nest away from the edge receive irate pecks from birds through whose territory they must pass on the way to the cliff edge.

While among the nests one has to look out for low flying parents returning to their young, and to avoid the flailing wings as a gannet settles at a nearby nest. Owing to the close proximity of one nest to another, a gannet alighting at its home is a fine sight. First the bird glides over the nesting area, probably several times, and height is lost each time the nest is approached, until the other sitting birds are only about six feet beneath. Finally the bird drops nearly vertically, at the same time thrashing the air with its wings, and thrusting its webbed feet forward to check the fall. Sitting at the cliff edge at the end of the island to admire the gannets in flight, one is unconsciously made to compare them with aeroplanes, which their huge wingspan, outstretched neck, and completely retracted legs and feet make them resemble. It is also very amusing to see a proud father gannet glide over, carrying in his bill a bunch of fluffy sea-weed that trails on both sides like a bushy moustache, as he goes to add to his already large nest.



The gannet in flight, with legs and feet completely retracted. It is interesting to compare this illustration with a photograph of the flight of a modern monoplane with retractable undercarriage.

Numbers of greater black backed gulls and herring gulls continually prowl over the nesting area, with a keen eye for an untended egg or chick, or any disgorged mackerel not swallowed by the young gannets. These gulls take care not to go too near an adult gannet.



A corner of the gannet rookery on Grassholm, the island off the coast of Pembrokeshire where many thousands of the birds make their home.

In view of the fact that only one egg is laid annually in each nest it is rather surprising that the gannet is increasing in numbers so rapidly. The bird is so large that it requires substantial food reserves. The fish on which it lives are inexhaustible, but they have to be looked for, a problem that perhaps is not very serious in view of the bird's powers of flight. On the other hand the long period of adolescence, lasting from four to five years, gives the bird ample chance to lose its life before it has had opportunity to replace itself. Large numbers of young birds are taken for food in some of the Northern Scottish colonies, and gulls account for many eggs and chicks. There are also other minor causes of sea bird fatality from which the gannet is not immune, such as becoming contaminated with ship's oil, and considering all the dangers to which the young gannet is subject, it may be assumed that about half of the eggs laid produce mature birds to carry on the race.

Although from the point of view of individual and close observation of the gannet, Grassholm is perhaps the best of the colonies in Britain, it is also very difficult to visit owing to its exposed position, and the necessity to use a small boat. The nesting season is very long, however. The early nesters return in March, while birds are still tending young in September, a month in which there are several suitable days on which the journey can be made safely.

As one leaves Grassholm in the evening, and the gaggling of the gannets dies away, it seems as if one is leaving what was intended by Nature to be a sanctuary for these white fishers. During the homeward journey, as a gannet overtakes the boat, one is reminded of the great distances travelled by these birds in search of mackerel, but they are well equipped for flying, with their huge wings, and ability to glide for long distances. I have seen a gannet round a headland and sweep across a whole bay, a distance of a quarter of a mile, without a single wing-beat.

Whilst sat on the cliff top at Dunnet Head in the North of Scotland, I have seen gannets passing through the Pentland Firth 400 ft. beneath, in threes and fives. Occasionally one of the birds would drop like a stone, diving head first into the sea for fish, and on reappearing on the surface would take off like a swan, accelerating its flight in pursuit of its companions. These gannets were proceeding away from Sule Skerry, Orkney, the nearest colony, which is about 40 miles from this headland.

The gannet is the largest British-breeding sea bird, and is reputed to outlive man. The other British nesting areas where these birds gather in large numbers are Boreray, the Stacks of St. Kilda, parts of the Shetland Islands, the Skerries in Orkney, Sula Sgeir north of the Butt of Lewis, Bass Rock in the Firth of Forth, Ailsa Craig in the Firth of Clyde, and the Skellig Rocks off the coast of Eire.



Splendid Work by a "Duchess"

The latest Stanier 4–6–2s of the "Duchess" series, both streamlined and otherwise, are doing magnificent work on the Anglo-Scottish expresses. Recently No. 6228 *"Duchess of Rutland,"* one of the streamlined engines, took over the haulage of the second portion of the up *"Mid-day Scot"* at Carlisle, the train being heavily loaded to 490 tons behind the tender. The start was five minutes late, yet so brilliant was the uphill work that Shap summit was passed nearly a minute early!

Up the continuous 1 in 132 gradient out of Carlisle speed rose to the most exceptional rate of 44½ m.p.h.; Penrith, 17.9 miles, was passed in 23¼ min., and things were so well in hand that on the final 1 in 125 ascent speed was allowed to fall to 36 m.p.h. So Shap summit, 31½ miles, was passed in 42¼ minutes. The easiest of downhill running followed, and right on to Preston the driver kept roughly a minute ahead of time, the latter station, 90 miles from Carlisle, being passed in 101¼ min. A series of delays from adverse signals and engineering slacks followed, eventually causing a loss of 6½ min. and the 141 miles from Carlisle to Crewe took 165¾ min. instead of the 165 min. booked.

The engine was then re-manned, Driver Moffatt of Camden taking over from Driver Baddeley, of Crewe North. The restart was 9 min. late, but some tremendous running soon brought the train on time again. After a steady ascent of the Whitmore bank, with a sustained 47 m.p.h. on the 1 in 177 gradient, *"Duchess of Rutland"* swept down the gentle descent to Stafford at 85 m.p.h. The re-aligned junction there was taken very smoothly at 53 m.p.h., and then Driver Moffatt went on to beat even the *"Coronation Scot"* schedule by a clear minute and a half between Stafford and Nuneaton, and with a 490-ton load! This involved an average speed of 71 m.p.h. over the 30 miles from Colwich to Nuneaton. Still there was no slackening of effort; Brinklow, 70 miles from Crewe, was passed in 66¼ min., but then followed signal stops, first outside Rugby and then at Bletchley. Even so Bletchley, 111.4 miles, was cleared in 113½ min., and after a steady recovery of speed Tring summit was passed at 54½ m.p.h., the 126.4 miles from Crewe having taken 131¾ min.

There was a glorious finish; speed rose to 85 m.p.h. at King's Langley, the slightly adverse stretch from Watford to just beyond Bushey troughs was cleared at 78 m.p.h., and a steady final maximum of 82 m.p.h. took the train through Willesden Junction, 152.7 miles, in 152½ min. A final signal check caused a loss of just over 1 min., but Euston was reached in 161½ min. from Crewe, 158 miles, a modest 7½ min. early! Delays accounted for at least 10 min. in running so that Driver Moffatt had gained 26½ min. on schedule! This run was timed by Mr. O. S. Nock.



A "Safety-First" operation; a pointsman clipping the switch blades of facing points in position at Paddington. This practice was followed during the period of emergency working, when points had to be hand-operated, after the fire that occurred in the arrival signal box last November. Photograph by W. S. Garth, Luton.

More Wagons for L.M.S. and L.N.E.R.

Following the successful introduction last July of 100 special shock-absorbing wagons for the conveyance of traffic that is particularly susceptible to shock, the L.M.S. have decided to build at their Derby Works a further 100 of these vehicles, of 12-tons capacity each. The first of these additional vehicles will be ready for service this month.

During this year the L.N.E.R. are to build 3,894 freight wagons, of which 3,600 will consist of 12-ton mineral wagons with end doors, suitable for conveying coal for shipment in Scotland. There also will be 200 brake vans to replace 200 that are due to be broken up, 40 fish vans, for the Grimsby to London, Leeds and Chester fish traffic, 50 banana vans, for service from London, and four carriage trucks for the conveyance of motor cars, theatrical scenery, aeroplane material and general traffic.

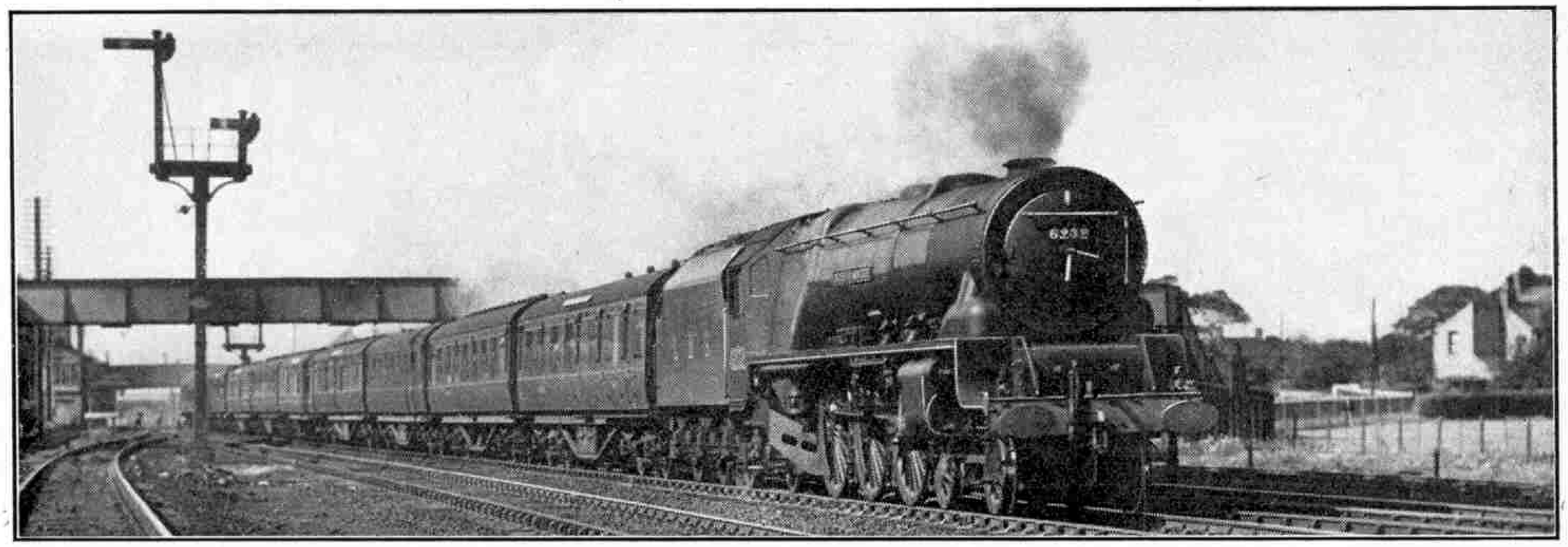
"The Coronation Scot" in U.S.A.

"The Coronation Scot" was shipped from Southampton Docks in January in the motor ship *"Belpamela."* The engine was hauled "dead" by an S.R. locomotive from Willesden Junction to Southampton. The coaches were hauled separately, and for their trip were coated with a wax preparation to protect them, while all movable fittings in them were lashed securely. On arrival at Baltimore about the 14th of this month the train will be made ready for the road in the shops of the Baltimore and Ohio Railroad.

An exhibition tour of 38 American cities and towns, covering 3,121 miles, will begin at Baltimore on 21st March and conclude at Hartford and New Haven, Conn., on 14th April. The train will be on show at the World's Fair, New York, from 30th April to 31st October.

The engine will be driven throughout the tour by F. C. Bishop of Camden, who has been a driver for 24 years and who drives *"The Coronation Scot," "The Royal Scot"* and on occasion the Royal Train. His fireman is J. McKinnon Carswell, a native of Scotland, who is also stationed at Camden. Driver Bishop has 41 years service and Fireman Carswell, who is passed to act as driver when required, has 18. Also accompanying the train, from a maintenance point of view, is Mr. F. A. Soden, who is a Foreman in the Erecting Shop at Crewe Locomotive Works.

The train consists of streamlined 4–6–2 No. 6220 *"Coronation"* and eight special coaches, and before it left for America the riding of the articulated coaches at high speed was tested in a "sprint" over the 19.8 miles from Blisworth to Rugby, covered at a speed of 62.2 m.p.h. Starting from rest at Blisworth, No. 6220, with its load of 262 tons reached a speed of 79 m.p.h. after 6.9 miles of practically level track to Weedon, which was passed in eight minutes. Up the 6½ miles 1 in 350 gradient to the south end of Kilsby Tunnel, speed did not fall below 77½ m.p.h., and on emerging from the Tunnel it rose to 86.6 m.p.h. at Hillmorton. The Driver and Fireman on this run were C. W. Langdale and W. A. Pointer, of Camden, and the times and speeds were recorded by Mr. D. S. Barrie.



The up "Royal Scot" near Acton Bridge, headed by No. 6232 "Duchess of Montrose," one of the ten 4-6-2s put into service last year. These and the corresponding streamlined engines of the same series have made a splendid reputation for themselves on fast and heavy L.M.S. expresses. Photograph by J. G. Muir, West Kirby.

Fine Running by L.N.E.R. Streamliners

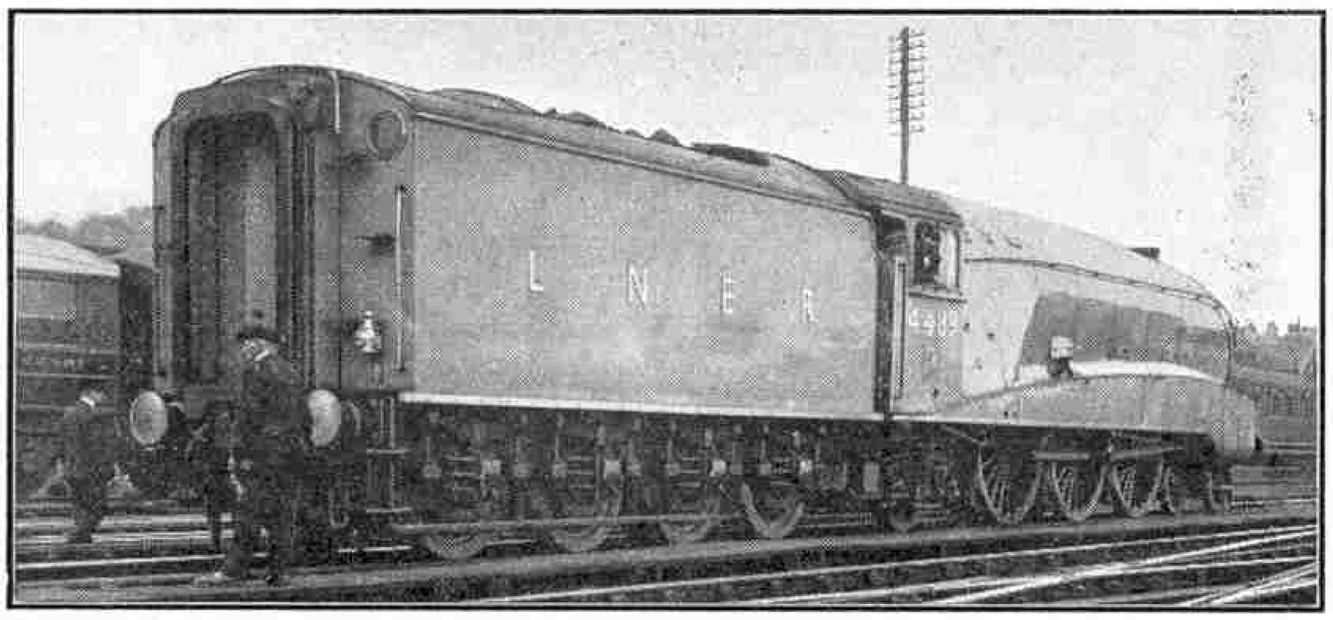
The now famous "A4" streamlined "Pacifics" of the L.N.E.R. first introduced for use on high-speed services, continue to maintain their splendid reputation for consistent running. Some interesting records of the operation over long periods of the streamlined *"Coronation," "West Riding"* and *"Silver Jubilee,"* and ordinary expresses, by these engines reach us from Mr. R. A. H. Weight, a keen observer of East Coast performances.

The southbound *"Coronation"* express is scheduled at 62.2 m.p.h. over the 124.4 miles from Edinburgh to Newcastle, its only stop, in 120 min. In the 43 trips between 1st March and 30th November 1938 there were only three non-punctual arrivals in Newcastle! Indeed, during three months between June and September, except once, the *"Coronation"* reached Newcastle only once later than 6.28½, though not due until 6.30! On the one occasion when the train was not early delay in the north resulted in a re-start 8 min. late, but the whole of the deficit was regained, and King's Cross reached punctually, by dint of a 70.4 m.p.h. overall average from the Tyne. The engine was No. 4493 *"Woodcock,"* in charge of Driver Auger of King's Cross, hauling the full load of nine cars or 325 tons gross.

The allowance of 237 min. for the 268¼ miles from Newcastle to King's Cross is much harder to achieve than the timing north of the Tyne. At the end of this long break of 43 trips, closely timed when entering the London suburban area, in August and September last, on 41 occasions the train was punctual or up to four minutes early. Once it was two minutes late, and the second delay, which was a little greater, was due to a slight mishap to another train.

In the opposite direction the booking is even harder, for the start-to-stop of 188¼ mile from London to York is run in 157 min., requires a mean speed of 71.9 m.p.h., the fastest steam schedule in Europe or the British Empire. Following this comes a sharp booking on to the second call at Newcastle, which has to be reached in 3 hrs. 57 min. from King's Cross. Five months' arrivals on Tyneside from 5th July 1938 showed a full 80 per cent. of punctuality. Of 76 trips checked, 42 were run into Newcastle before time to the extent of 1 to 3 minutes; 17 others were punctual; 16 showed an average of 4¾ min. late and on the remaining one there had been a casualty in the shape of an overheated axle-box on the engine. Strong winds as well as relaying or other special engineering slacks can constitute a serious hindrance to such schedules, but any lateness is frequently recovered between Tyneside and the outskirts of Edinburgh.

Outstanding features of the Leeds–London running of the *"West Riding Limited"* have included an occasion when a late passage of Doncaster to the extent of 3½ min. was converted to an arrival 3 min. early. An average of 79.2 m.p.h. was maintained for 144 miles, eight service slowings of varying severity were observed, and 100 m.p.h. was touched twice.



Backing on! The locomotive is No. 4489 "Dominion of Canada," one of the best known of the L.N.E.R. streamliners. Photograph by W. H. Whitworth, Manchester.

Of 30 arrivals during October and November 1938 of *"The Silver Jubilee"* at King's Cross 26 were punctual or slightly early, though there had been delays; the remaining four were not much behind time, two of the days being decidedly foggy. Journeys by the L.N.E.R. streamlined trains therefore can hardly fail to be a thrilling memory to the railway enthusiast.

The non-stop *"Flying Scotsman"* had a most successful season of seven-days-a-week running over the world record distance of 392.7 miles in seven hours in each direction during last summer. No engine trouble was evident, and two of the streamlined "Pacific" locomotives made many trips continuously. No. 4489 *"Dominion of Canada,"* of King's Cross, was on 33 of the non-stop runs; No. 4491 *"Commonwealth of Australia"* of Haymarket, Edinburgh, made 36 such trips during the season. The down train, after running 268 miles over the busier part of the line, where the fastest part of the schedule applies, was punctual or slightly early at Newcastle on 49 out of 69 occasions. The load behind the tender varied between about 440 and 480 tons. The opportunity between Newcastle and Edinburgh for time recovery was fully utilised when necessary. The up service did similarly well and presented, like other East Coast services, a good punctuality average.

In the winter service when intermediate stops are made loads tend to become heavier and the weather is generally unfavourable, the high quality of the locomotive work has been maintained.

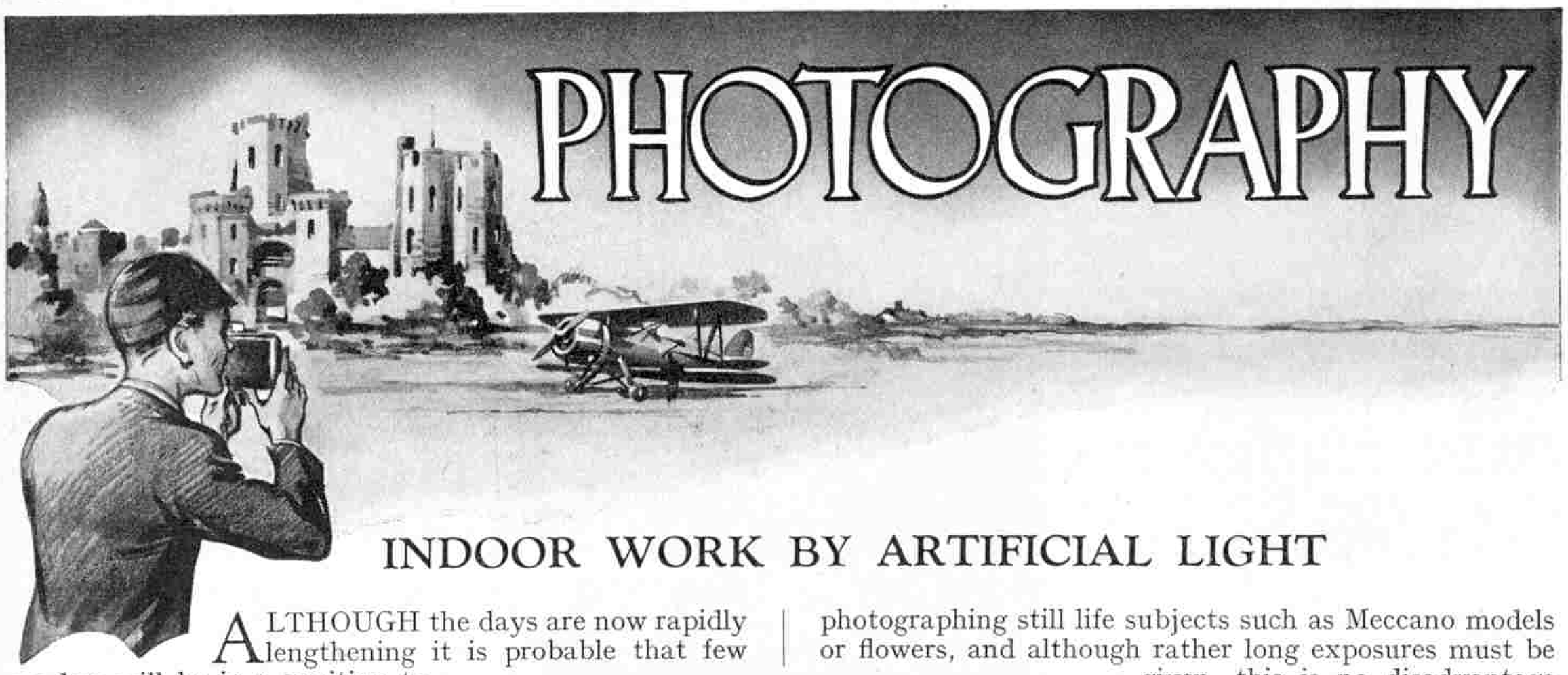
An Unusual Load

In order to carry to Glasgow 600 tons of delicate equipment for new manual and automatic telephone exchanges that is being made in Coventry, the L.M.S. have fitted a number of wagons with a special rubber-bearing auxiliary springing system, eliminating shock to the containers in which the equipment is loaded. Each container-load includes many miles of wiring and thousands of electrical contacts, and rubber is used in packing at vulnerable points.

Over 250 container-loads will be worked by the L.M.S. from Coventry to Glasgow in the delivery of this apparatus over a period of several months. Each trip involves a journey of 630 miles per container, and the fleet of containers used will therefore have travelled more than 157,500 miles by the time delivery is completed.

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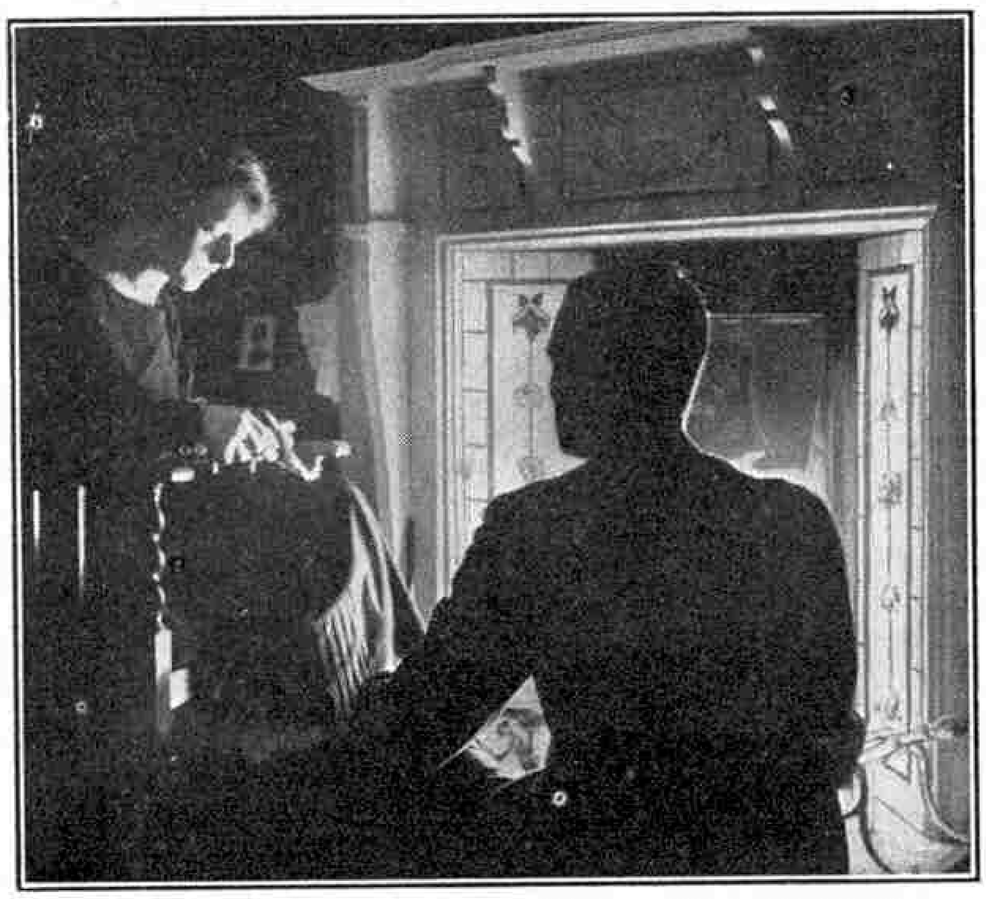
L.M.S. class "5P5F" 4–6–0s Nos. 5467-71 and class 8 2–8–0 tender engines Nos. 8096-7 have been delivered from Crewe. Derby Locomotive Works have supplied new 2–6–4 tank engines Nos. 2644–51.



INDOOR WORK BY ARTIFICIAL LIGHT

ALTHOUGH the days are now rapidly lengthening it is probable that few readers will be in a position to undertake much photographic work other than indoor during the next few weeks. For this reason I am dealing this month with photography by artificial light, a branch of the hobby that is well within the capabilities of even the cheapest cameras.

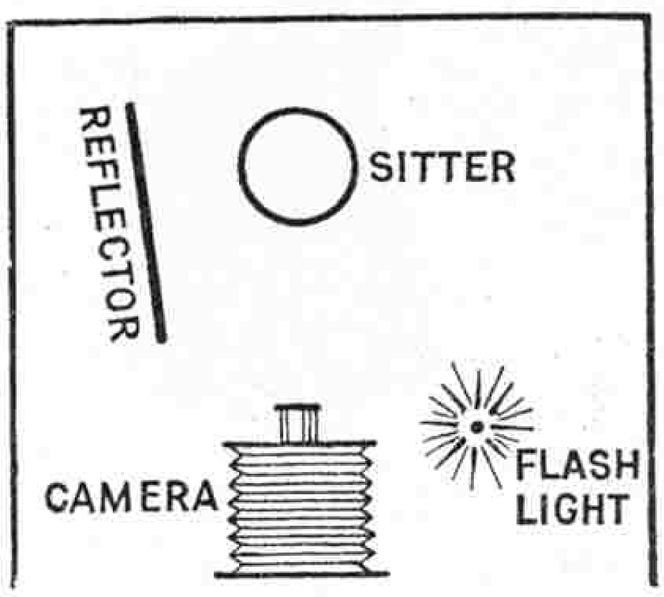
A great advantage of photography by artificial light is that the power of the light is always under control, and does not vary from hour to hour like natural lighting conditions. After a little practice, therefore, a successful picture can be taken every time. Another point, and this is one that many amateurs fail to realise, is that the powerful flashlight and the special electric bulbs now available provide them with a source of light that, for many subjects, puts a simple box camera practically on a level with an expensive instrument.



Fascinating firelight effects such as this are quite easy to obtain with any type of camera and a small quantity of flashpowder.

First I want to say a few words about backgrounds. If there is a room in the house with light-coloured distempered walls, this will make an ideal studio, for the walls will provide an excellent background free from any pattern likely to draw the eye away from the subject of the photograph. When such a wall is not available, however, a good alternative is a sheet of plain grey-tinted paper.

The most suitable films or plates for artificial light photography are the panchromatic kind, and if plates are used they should be "backed" in order to avoid halation, the fuzzy margin of white that often appears to surround the outlines of photographs taken in a strong light.



This diagram shows suitable arrangements for taking a photograph by flashlight.

The next important thing is to decide the type of artificial lighting to be used. If electric light is available, excellent results can be obtained with ordinary electric bulbs. Two or three of these will provide sufficient light for photographing still life subjects such as Meccano models or flowers, and although rather long exposures must be given, this is no disadvantage with subjects of this kind. For portraiture, however, one of the more powerful light sources such as the special photographic electric bulbs, flashpowder or magnesium ribbon should be used.

Several different makes and types of these special bulbs are available, among them being the well-known "Photoflood" and "Sashalite" bulbs. The former can be plugged into an ordinary lamp socket, or can be used in conjunction with one of the various types of reflectors now on the market. These bulbs have a working life sufficient to permit the taking of hundreds of photographs. The "Sashalite" bulbs give only one very brilliant flash and are then useless. They are fired electrically by means of a small flashlamp battery and are made in various sizes. They consist of a sealed glass bulb similar to an ordinary electric lamp, but containing finely beaten aluminium foil and oxygen. They are fired by connecting them to the terminals of a flashlamp battery. The current causes the foil to ignite instantaneously, thus producing an extremely brilliant flash of about 1/50 second duration. The bulbs are perfectly safe to handle and produce no smoke, smell or noise.

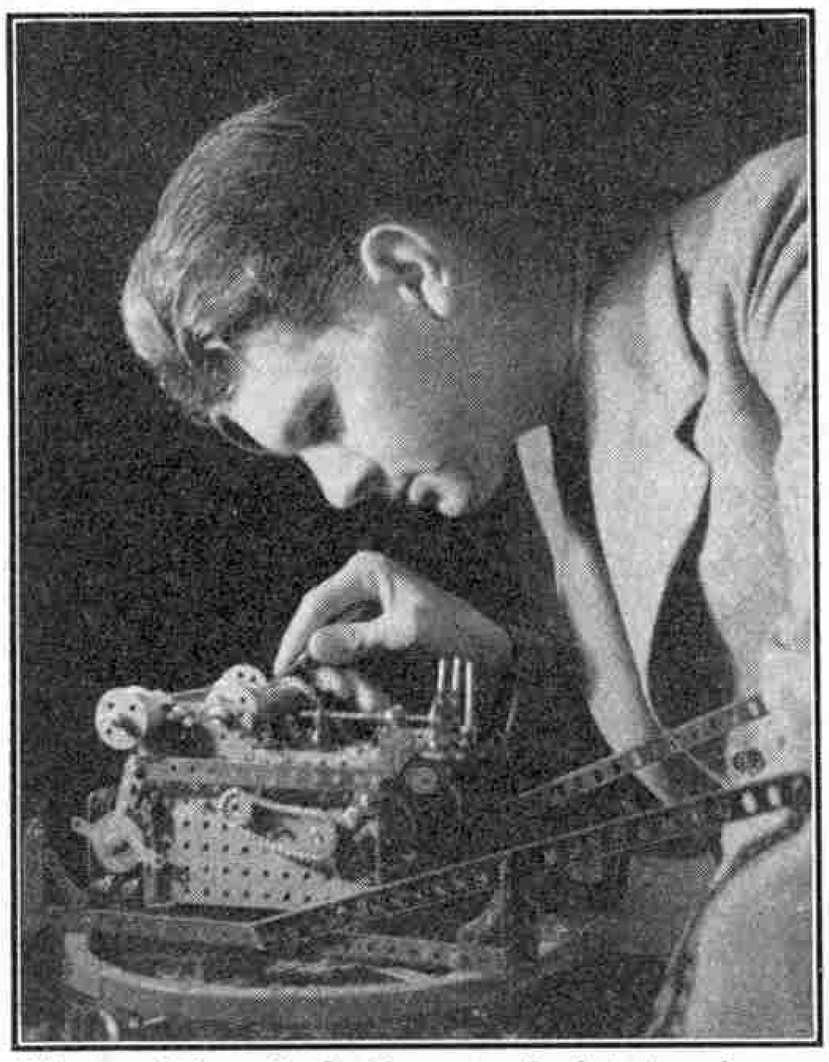
One of the most commonly used forms of artificial lighting for photography is that produced by burning flashpowder. The intense brilliance of this light enables very striking effects to be secured by instantaneous exposures, and is most suitable for taking photographs of groups of people, still life subjects, silhouettes, candle-light and firelight effects. In fact it is ideal for all indoor subjects that by daylight are either difficult or quite impossible with simple apparatus.

It is wisest to buy a good brand of flashpowder such as Johnsons', Geka, Agfa or Granville, all of which are

excellent. There are several methods of firing the powder available, such as touch-paper or flint and spark, but for portraiture work the ideal method is to use one of the electric means of ignition, which ignite the powder instantly, and therefore allow exposures to be made at the most suitable moment.

Flashpowder is quite safe to handle provided proper care and precautions are taken in using it. The bottle containing the supply of powder should never be left uncorked, and should always be kept well out of the way of lighted candles and matches and carelessly deposited cigarette ends! When the flash is fired the lamp or tray containing the powder should be held well above the head and behind the camera and a little to one side of it, and care should be taken to see that there is no danger of the flash setting fire to inflammable materials in the neighbourhood.

Success or failure in flashlight work depends to a great extent on the position of the flash in relation to the subject and camera. The most suitable position for average subjects is indicated in the diagram on the opposite page.



This fine photograph of a Meccano enthusiast at work on a model was taken by J. R. Tottle, Taunton. Two "Photoflood" bulbs provided the illumination, and the exposure given was one second at F/8.

Another commonly used form of artificial light for photographic purposes is that provided by magnesium ribbon. This is not so intense as flashlight, however, and is not suitable for instantaneous exposures. The ribbon may be purchased in small quantities contained in special holders provided with an arrangement for feeding out the length of ribbon required. If a detached piece of ribbon is used it should be gripped at one end in a pair of pliers, and should be held well away from inflammable materials when it is ignited. A sheet of tin should be held under the burning ribbon to avoid trouble if a blazing piece should break off and fall. Using a fast panchromatic film and a lens aperture of about F/8, a piece of ribbon about 10 in. in length will be required to produce a fully exposed portrait negative.

Most artificial light failures are due entirely to what is termed "harsh lighting" with consequent objectionable shadows. Fortunately the trouble can be overcome either by moving the subject to be photographed further from the light or by placing a piece of white muslin or similar material between the light and the subject to act as a diffuser. Another method is to use a white reflector such as a sheet of white paper to throw light upon the darker side of the subject. Too harsh contrasts also may be due to under-exposure, that is, the use of too little flashpowder, or too long development of the negative.

Among the most interesting branches of flashlight work are silhouettes and fireside effects. The operations involved in producing a silhouette, of which a typical example is illustrated on this page, are quite simple. First of all, a white sheet is hung across the open door of a room so as to cover completely the opening. The sitter is then posed inside the room for a profile view, and the camera, which also is inside the room, is carefully focussed in order to obtain a perfectly sharp outline. When all is ready the light in the room is turned down, the shutter is opened, and an assistant outside the room ignites about half a thimbleful of flashpowder. The flash illuminates the sheet and the result is a photograph showing a background of white with a black silhouette of the sitter.

Many subjects will suggest themselves for fireside pictures, and with a little thought many original settings and groupings can be planned. There is no difficulty in making pictures of this kind provided care is taken to shield the camera lens from the direct glare of the flash. This is best done by arranging one person so that he is directly in the line of view from the camera to the fire. If an aperture of F/11 is used about one quarter of a teaspoonful of flashpowder will be required. This should be placed on a piece of tissue paper and rolled very lightly into a loose ball. Care should be taken to see that the paper is not tightly screwed up. Focussing is done with the room lights full on and then the lights are extinguished. When everything is ready, the shutter of the camera is opened and the powder ball is thrown into a glowing part of the fire. Provided that the grouping is natural, the results obtained in this manner are artistic and interesting. If a box camera is used, the distance from the subject to the lens must be carefully measured.



Silhouette portraits of this kind can be easily produced with the simplest cameras.

Prizes for Readers

Photography by artificial light provides considerable scope for interesting work, and to encourage experiments we are offering prizes for the best indoor photographs taken by artificial light. In this contest there are no restrictions as to subject, size of prints, plate, film, paper or type of camera. The subject must be arranged and photographed by the competitor himself, but developing and printing may be done by professionals if necessary.

Each print submitted must be accompanied by details of the camera, film or plate, exposure and light by which it was taken.

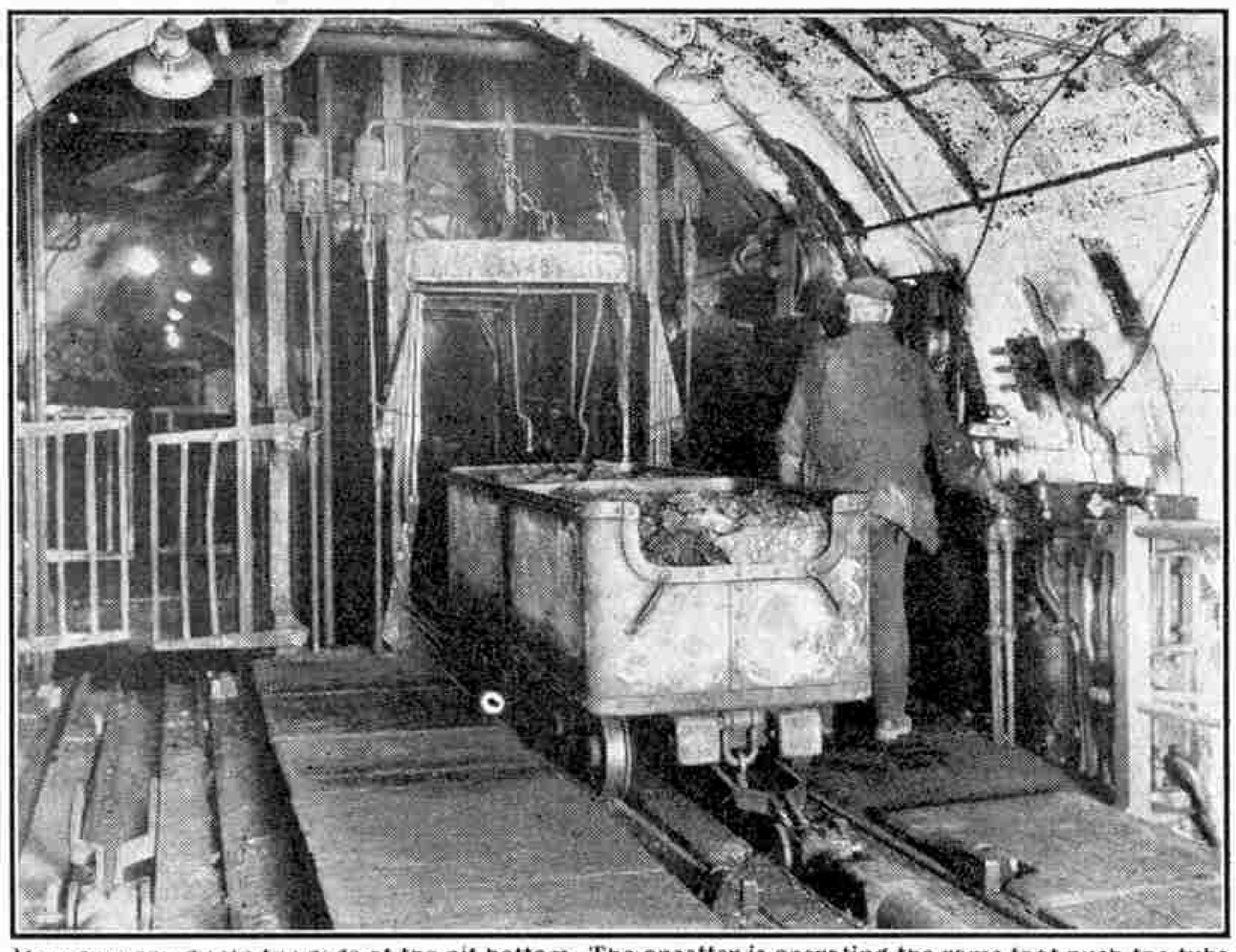
Prizes of photographic materials or Meccano or Hornby products to the value of 21/–, 15/– and 10/6 respectively, will be awarded for the three best prints received from readers living in the British Isles, and there will be a similar set of awards for the three best prints sent by Overseas readers. Entries must be addressed to "Artificial Light" Competition, Meccano Magazine, Binns Road, Liverpool 13. Those from readers in the British Isles must arrive not later than 28th February, but Overseas entries will be accepted until 29th April.

Coal-Mining in Britain

II.—Washing and Screening Processes

By a Mining Engineer

IN the "*M.M.*" for January 1939 I described the general method of coal winning, modern apparatus used in machine mining, and the underground layout. The coal that comes to the pit top is of all shapes and sizes, just as it is gathered up after a "fall." But it cannot be marketed like this. The large lumps, for example, would be excellent as a locomotive fuel, but useless for coking; and so the coal is graded very carefully according to size. With the smaller kinds there is usually found a considerable proportion of dirt, and in order that the fuel as marketed shall have as high a calorific value as possible per unit of weight this dirt must be removed. This is particularly important with small coals used for the manufacture of coke. I should mention, too, that in every "fall" at the coal face there usually comes down a small proportion of rubbish, rock, shale, and such like; the larger pieces can be separated from the coal at once, put on one side and then sent up to the surface during the shift when repair and maintenance work is done. The pit bottom is not the place for cleaning the smalls, however.



Raw coal going into the cage at the pit bottom. The onsetter is operating the rams that push the tubs into the cage. Photograph by courtesy of the Westinghouse Brake and Signal Co. Ltd.

At the pit top every process in the refining of raw coal is automatically controlled. Last month several appliances used in machine mining were described. These, while greatly speeding up and cheapening production, are controlled by the miners, and the progress of coal on the various belts is such that it can always be watched and checked. In the various cleaning plants the processes function without any human control once they are started up and a steady flow of coal is supplied to them. Their rate of working has to be arranged to correspond with the rate at which coal is pulled up the shaft.

Before any form of cleaning can be done, however, the raw coal, as pulled up from underground, has to be discharged from the tubs. This again is a mechanised process and is carried out by an appliance called a tippler. A tippler is a kind of cage, though only large enough to hold one tub; it is cylindrical in outward appearance, the axis of the cylinder being in line with the line of the approach rails. Automatic marshalling gear outside regulates the queue of waiting tubs so that only one is allowed to enter the tippler at a time. Short stroke pushers are often used for loading up, and then interlocking has to be included in the automatic controls to ensure that a pusher cannot begin to operate unless the tippler is in the correct position to receive a tub. The action of the colliery tippler is just the same as that of the tippler for full-sized wagons in the mechanical coaling plants seen at many locomotive depots on British railways. As soon as the tub is completely inside, and properly held, the tippler is caused to revolve. What is normally the top of this rather special kind of cage is open, and when the tippler has completed half a full revolution and the tub is consequently in the upside-down position, the coal is discharged on to a belt conveyor passing below.

The tippler house is one of the very few parts of a modern colliery that is not completely mechanised. After the tubs are marshalled away from the cage at the top of the shaft they run by gravity down a single line of rails to the weighbridge, passing very often through an airlock on the way. At the weighbridge the amount of coal is checked, and then the tubs are allowed to run down a further slight incline into the tippler house. Here there are usually half a dozen or more tipplers, and the oncoming tubs have to be switched on to the various tracks in a fashion something like that of a railway goods yard. One or two pointsmen are of course needed for this.

Before passing on to the refining processes I may mention briefly the rest of the circuit followed by the tubs at the pit top. Since leaving the shaft they have been running by gravity, and the level of the rails in the tippler house is therefore somewhat below the track level at the pit bank. After the coal has been discharged by the tipplers the tubs are regulated so that they converge on to a single track and run for a short distance farther downhill. They then come to an appliance called a creeper. The action of this may be likened to that of a bucket elevator in which the buckets are replaced by hooks. The hooks travel between the rails, engage with the axles of the tubs, convey them up a fairly steep gradient, and then release them at such a level as will enable them to run by gravity down to the pit bank ready for remarshalling into the cage, ready for the return journey to the shaft bottom.

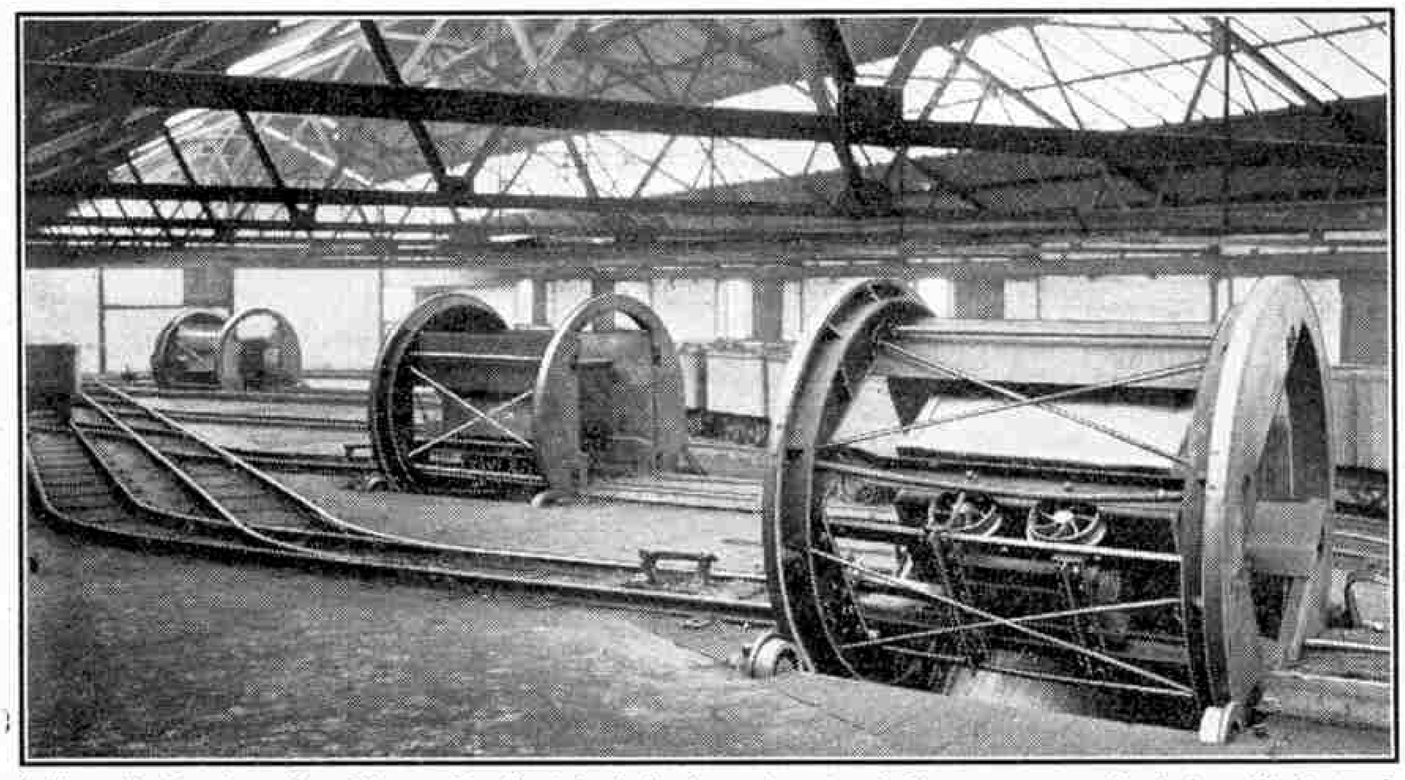
The business of sizing and cleaning the coal is usually carried out in a self-contained plant, as the two processes are in many respects linked together. In a number of collieries, however, the demand for the various classes of coal varies considerably from week to week, so that the plant often includes crushers for augmenting the output of the smallest grades when occasion so demands. The raw coal is sorted out according to size on what are called screens. These screens are used at many points in mechanical cleaning plants, and before we consider the sequence of operations in detail it is as well that the working of the screens should be understood. Screens are nothing more than large riddles, or sieves; in those used for separating the larger sizes the perforated bottom is a heavy steel plate, inclined to the horizontal and drilled with a number of holes all the same size. The screen is caused to oscillate at high frequency; the smaller lumps fall through the perforations, while the larger slide down to the lower end, and are conveyed thence to another part of the plant. For grading the smaller sizes stout wire meshing is often used.

Within even the comparatively small area of Great Britain the physical nature of coal mined varies enormously in different parts of the country. These different varieties need equally diverse methods of cleaning. Scottish and Northumberland coals have a degree of tackyness that makes them particularly suitable for cleaning by washing, whereas certain grades of Kentish coal are apt to crumble and are better treated by dry-cleaning processes. Out of many systems of coal washing and cleaning I have chosen for detailed description that which operates on what is known as the float-and-sink principle.

From the tipplers the raw coal comes on to the first set of screens. Here are separated out all the lumps bigger than five or six inches, and these large sizes are usually passed straight on to hand-picking belts. It is the "under five inch" coal with which the washery is concerned, but before reaching the cleaning stage yet another sub-division is carried out. On a further set of screens all the very smallest stuff is taken out and used, just as it is, for firing boilers, or discharged into wagons for sale as cheap slack. The main body of the raw coal then passes into a coal cleaning funnel, or cone. As its

name implies, this vessel is in the shape of an inverted cone. It is full of a mixture of sand and water. The sand is introduced near the top, or mouth of the cone, and the water enters at a series of points at varying heights. The sand is kept from sinking to the bottom partly by means of an upward flow of water, and partly by means of revolving blades that keep the water in a state of agitation. The coal to be washed is introduced at the top of the cone, and the amount of sand in suspension in the water prevents the coal from sinking.

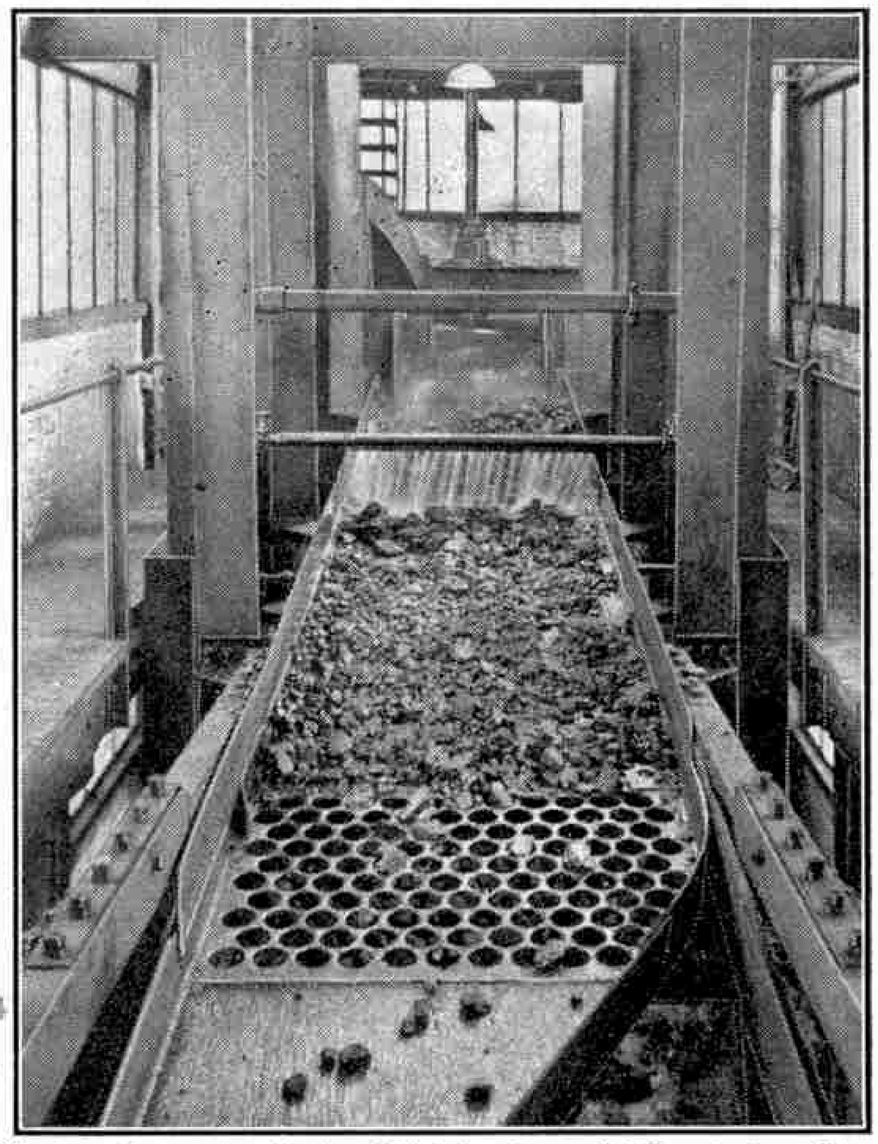
The strength of the upward currents of water, the quantity of sand, and the speed of the revolving agitator blades are regulated so as to give the correct time of washing to the coal, and after that it is gently sluiced over to the de-watering screens. During the process of washing the dirt, refuse, and shale sinks to the bottom of the main washing cone. This rubbish is taken out periodically, though even of this very little is quite useless matter. The greatest care is taken to reclaim the considerable amount of sand that becomes mixed with the refuse, and the mixture is put over de-sanding and de-watering screens. The sand and water extracted are then pumped back into the main reservoir, which includes one chamber for clear water; it is from this latter that the agitation water supply is taken.



Colliery tipplers in action. The coal in the tubs is discharged on to a belt conveyor passing below. Photograph by courtesy of "Colliery Engineering."

Very little of the actual washing process can usually be seen, as the cone is a closed vessel; but once the coal leaves the washer its progress can be followed right away to the waiting railway trucks. The inside of the building containing the sizing screens for the clean coal has the spick and span look of a ship's engine room, and the likeness is increased by the presence of inspection galleries floored with chequer plating. The coal coming out of the cleaning cone enters upon the uppermost of two long screens; the one with the coarser mesh is immediately over the top of the other, and both are being mechanically oscillated backward and forward. The smaller pieces immediately fall through on to the lower screen, where the coal is again subdivided. The so-called "smalls" are separated from the next larger grade, which are called "nuts," and fall through the meshes of the lower screen on to a loading chute just above one of the railway trucks. In the meantime the larger fragments pass forward and are joined by others in the same grade coming through from the upper screen; the latter is busy separating the largest size, which are called "cobbles."

The nuts and cobbles are loaded severally into the waiting railway trucks by what are called boom loaders. These consist of a travelling belt working on an arm that is hinged at one end like the jib of a crane. Normally the belt is at rest, and the arm is horizontal; but when coal is ready to be loaded the arm is lowered through a small angle and the belt is set going. The arm is quite long, and as the slope is on this account not steep the coal is conveyed gently, with no danger of breaking or crumbling taking place. The whole washery plant, including the screens, the loaders, and the actual cleaning equipment can indeed be considered as a mechanised factory in which the performance of every unit is co-related. Every individual appliance must be so designed that the flow of coal is uniform the whole time; the process must be equally rapid at each stage, or else choking and unsatisfactory working would result. A plant such as I have just described is capable of dealing with a steady flow of 80 tons per hour.



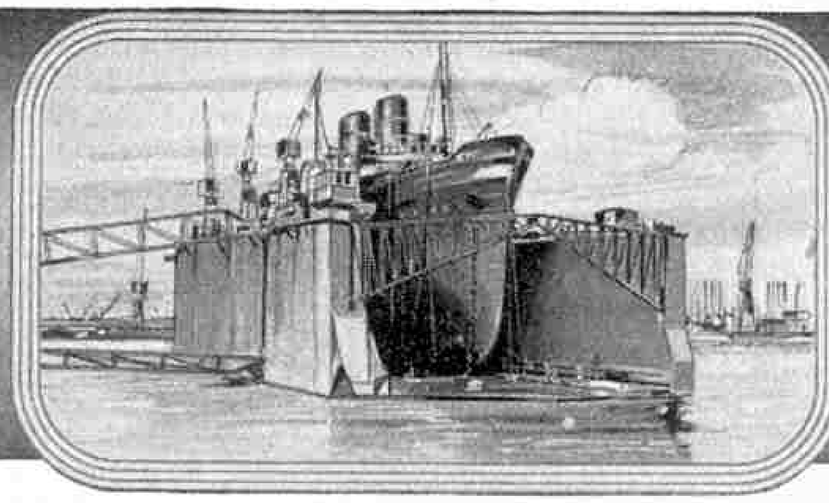
Coal on the screens that sort it into pieces of different sizes. The screens are vibrated mechanically to help in the separation of the various grades.

In another system of coal washing the nuts and slack are separated out first, and each is given a special treatment. The nuts are made to cascade over a series of weirs, immediately beyond each of which an upward stream of water keeps the coal in suspension and passes it on to the next weir, while the heavier particles, stone, dirt, and such like, descend to the bottom of the washer. The slack is washed in long troughs so constructed that the rubbish is caught in a sump, and only the pure coal passes on. In modern collieries the washery can usually be recognised by the striking coned formation of the slurry tower. This must not be confused with the washing cone; the slurry tower is a huge settling tank whence all the waste from the various sumps and de-watering screens is pumped. Such water includes a small proportion of slack; in the conical tower it is allowed to settle and thicken, and then it is conveyed by pipes to special slurry de-watering screens. Here the slack is separated and the water purified ready for another cycle of operations in the washery. By this time it will be realised that nothing whatever is wasted in these modern coal handling plants.

But as I explained earlier in this article it is not always possible to clean coal by washing. It will not always be a paying proposition to install the extra plant necessary for the treatment of the slurry, and in many localities water is plentiful and there is no need to conserve supplies. In such cases there would be a murky discharge from the plant, and this has to be deflected into some neighbouring stream. In many districts, however, pollution of streams, even to a slight extent, would not be tolerated, and there is nothing for it but to use dry-cleaning in some form or other. The principle underlying dry-cleaning of coal is simple enough. The raw coal is graded into the various sizes, and each of these sizes is transferred to a separate cleaning "table." A "table" consists of a vibrating screen through which is blown a current of air; the air carries away with it all the small particles of dust, dirt, and other refuse, leaving coal that contains less than one per cent. of impurities.

The business of dry-cleaning of coal must not be confused with the process of de-dusting, which is sometimes employed with coal that is of a crumbling nature, prior to its passing through a washing plant. In a de-duster the small coal falls through a chamber in which there is an upward current of air.

While on the subject of dust removal another very interesting apparatus may be mentioned, as illustrating the care taken nowadays in the handling of coal at all parts of a colliery. When dealing with the pit bottom working I wrote of the belt conveyors that are often used for bringing the coal from the face to the point of loading into the tubs. In a similar way to that in which the full-sized railway trucks are filled, the tubs are charged by means of a boom loader. As the coal falls from the travelling belt into the tubs a certain amount of dust is created. In the ventilating air current this is carried about and eventually deposited on the walls of the tub road. Although in the form of fine dust, this is perfectly good coal, and its blowing about is so much waste, as well as making things unpleasant for the men in charge of the loading operation. This trouble is obviated by an ingenious form of dust extractor. A hood is fitted over the loading point, and by means of compressed air a flow is induced down the funnel-shaped entrance to the extractor. The dust-laden air on entering meets a mist of very fine water particles, and this wets the coal thoroughly.



SHIPPING NEWS

A New Quick-acting Rudder

A new type of rudder has been invented by Mr. W. Stewart Collie, a naval architect of Glasgow. It is known as the "Hydrogap" Rudder, and is being made by Nautical and General Industries Ltd., London. It is a development of the widely-used streamlined rudder, which has a fixed forward part and a movable after part pivoted on the after edge of the fixed portion, but in the new rudder the point about which turning takes place is farther forward. The effect is to open up a gap between the two parts of the rudder when this is moved from the midship position, and this gap increases in width as the rudder angle is increased. Through this gap rushes a narrow column of water, at high pressure and accelerated speed, which flows along the opposite side of the rudder, increasing the pressure there and giving a greater turning force.

It is claimed that a Hydrogap rudder is more effective than a larger one of any other design, and requires less powerful steering gear. Tests have been made with a cabin cruiser 30 ft. long, driven by a 10 h.p. engine and fitted with the new rudder. These have shown that a complete circle can be made in less time than is required with other designs, and that the Hydrogap rudder has less effect in reducing speed during a turning movement.

Coming Launches

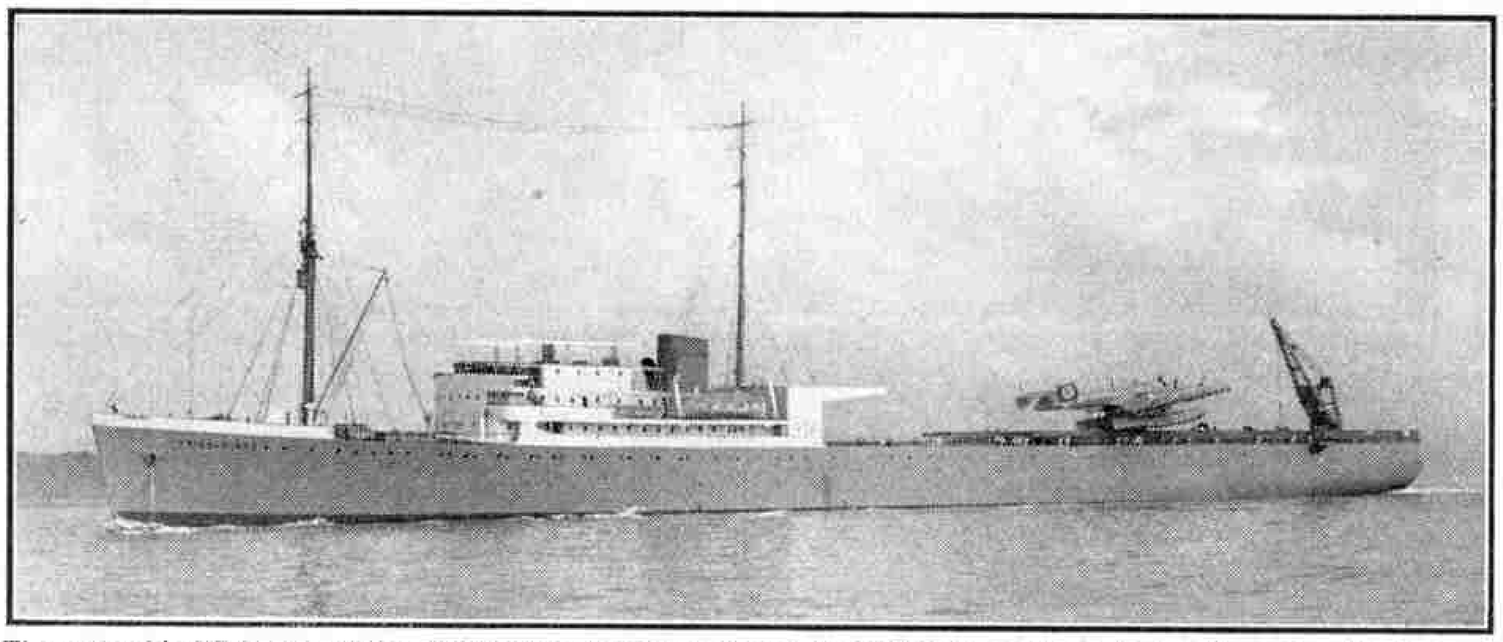
The 35,000-ton battleship *"King George V"* will be launched by H.M. The King at the Walker Naval Yard of Vickers-Armstrongs Ltd. on 21st February. This vessel was laid down in January last year.

Another important launch in the near future will be that of the new Royal Mail liner *"Andes,"* under construction at Belfast by Harland and Wolff Ltd. The *"Andes"* will be of 25,800 tons gross, and is expected to be one of the most luxurious vessels ever built. She will be launched and named by H.R.H. the Duchess of Kent, who will be accompanied by the Duke. The launch will take place on 7th March.

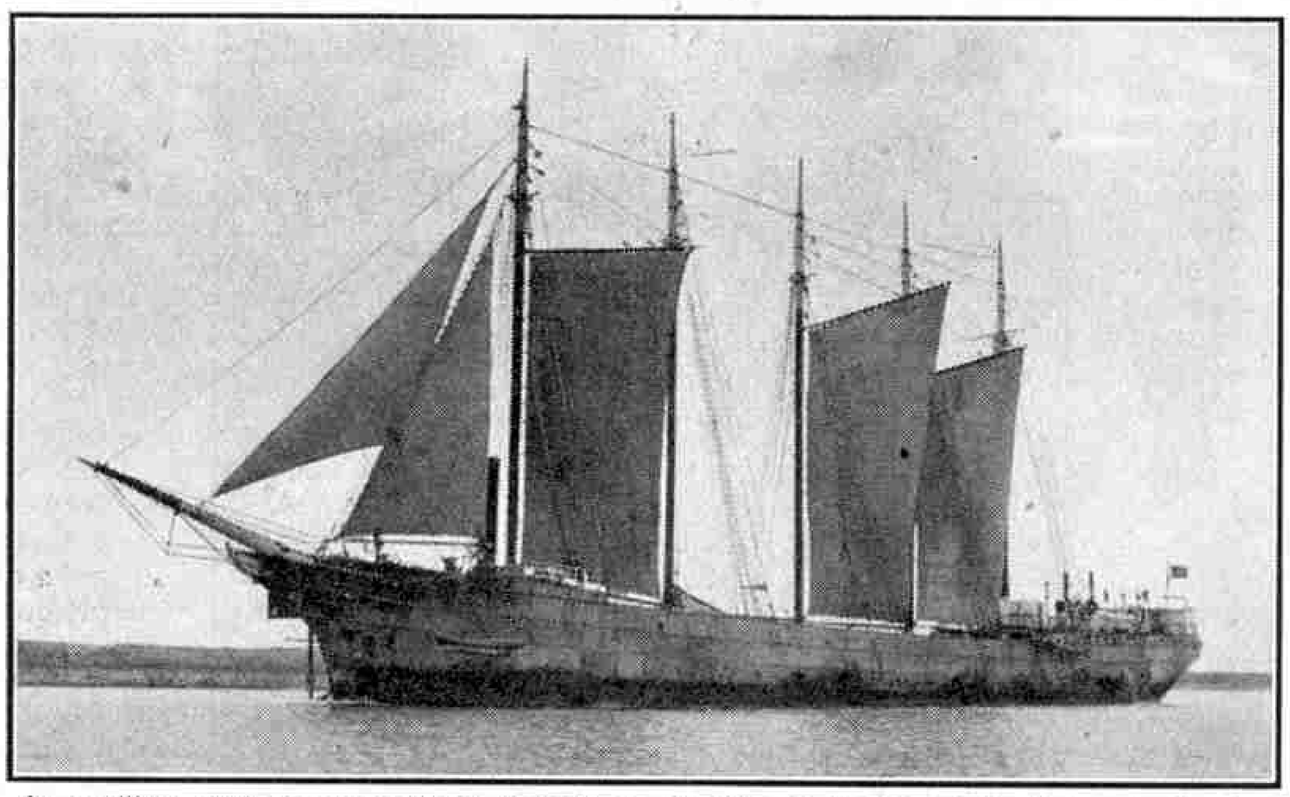
The End of the *"Berengaria"*

Yet another famous Cunard White Star liner has passed. In December last year the 52,101-ton liner *"Berengaria"* was taken to Jarrow for demolition by the Jarrow Shipbuilding Company. The vessel has been purchased at a cost of over £100,000, by Sir John Jarvis, who has undertaken this work to give employment at Jarrow, and for two years some 200 men will be occupied in breaking her up. During the auction of the ship's furnishings that preceded the breaking up her bell was sold to an American for £100.

The *"Berengaria,"* formerly the *"Imperator,"* was built at the Vulcan-werke, Hamburg, for the Hamburg-Amerika Line. She made her maiden voyage in June 1913, and was in New York when the Great War broke out. Later she was seized, and at the end of the War was handed over to the Cunard Line and placed in the North Atlantic service.



The motorship "Friesenland," a "catapult" ship used in connection with German transatlantic air services. Photograph by courtesy of Deutsche Lufthansa, Berlin.



An auxiliary steel schooner passing through the Suez Canal. Photograph by P. Lawrie, London.

A Sailing Ship in the Suez Canal

The lower illustration on this page shows the steel schooner *"Frieda"* with auxiliary engines in the Suez Canal. The vessel seems oddly out of place in the canal, one of the engineering wonders of the world and more suited to the giant liners of to-day, and a further contrast with sailing ship days is provided by the powerful searchlight hanging over her port bow. All ships passing through the Suez Canal must carry a searchlight. Liners and mail vessels making the canal passage regularly carry one as a permanent fitting, but for other craft a temporary unit is supplied by the authorities, who remove it on the completion of the passage.

The use of the searchlights is very important when negotiating the canal, and cars are not allowed to travel at night on the fine road that runs along the canal bank from Port Said to Ismailia, as their headlights might interfere with the navigation of ships. The road is owned by the Suez Canal Company and can be used by tourists provided a pass is obtained.

The sailing ship shown was about 12 miles from Port Said, and has just passed the last of the stations situated along the canal at intervals of about 12 miles. At these stations ships receive instructions regarding their passage. Sometimes a fast mail boat is coming through, and a slow-moving vessel is stopped and tied up at the berth while the mail boat passes.

P. Lawrie.

Name Chosen for New Liner

The United States Line have decided to give the name *"America"* to the new liner being built for them by the Newport News Shipbuilding and Dry Dock Co. The vessel will be launched this year, and will be ready for service on the North Atlantic route in the Spring of 1940. She will have a designed displacement of about 34,000 tons, and will be capable of carrying 1,219 passengers. It is estimated that her cost will be about £5,150,000.

Salvaging Cargo Worth £5,000,000

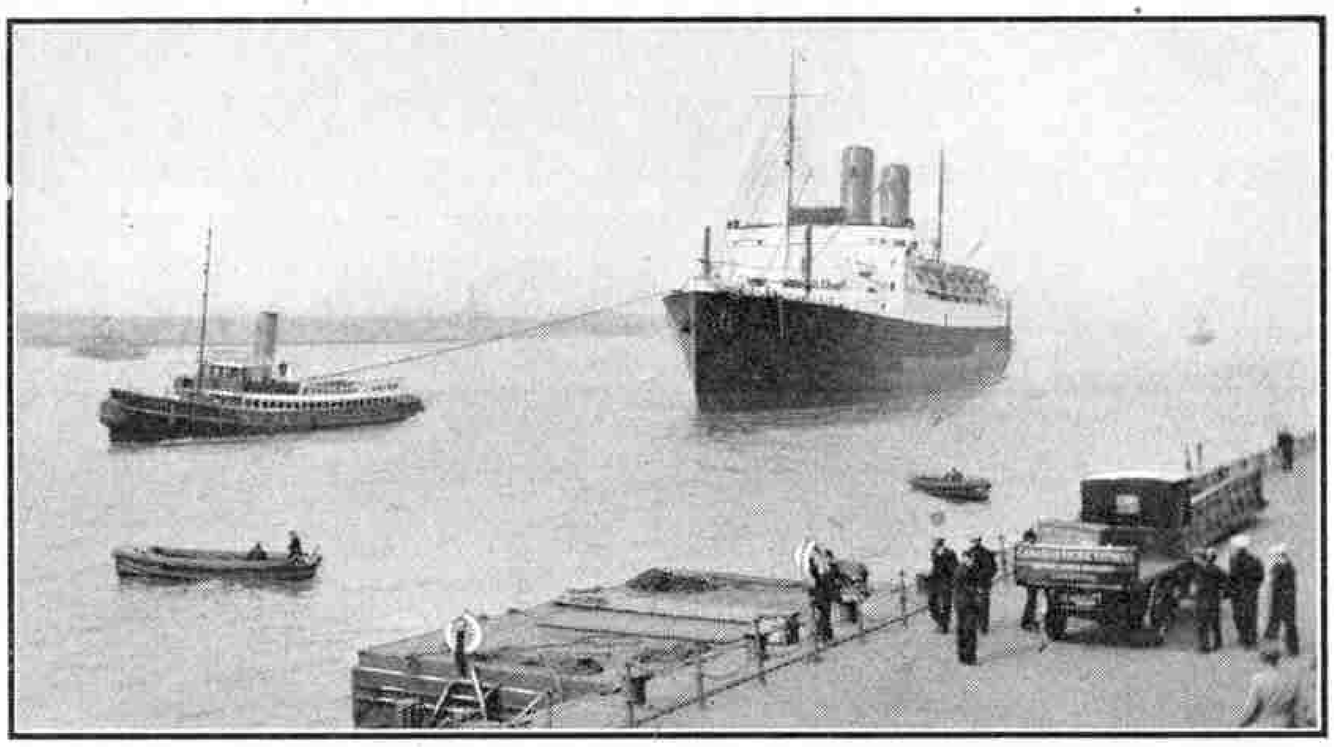
A company has been formed in Johannesburg to salvage the *"Grosvenor,"* which was wrecked near Port St. John, on the south-east coast of Africa in 1782. She was one of the most important ships of the East India Company, and is believed to have been carrying an exceptionally large cargo, including gold and silver bars and precious stones now worth about £5,000,000.

A unique method will be employed in the work. A breakwater 13,000 ft. in length is to be built round the gully in which the ship sank. Inside the breakwater a watertight dyke, 400 ft. in length and similar in construction to those used on the Zuider Zee, will be constructed, and the gully will then be pumped dry so that the actual salvage work can be commenced. The operations will take about a year to complete and will cost £35,000. If the estimated value of the cargo is correct, it is expected that there will be a surplus of £3,650,000 after everything has been paid. This includes 15 per cent., or about £750,000, payable to the Government for permission to salvage, and another £525,000 in taxation.

The Eventful Career of the *"Naldera"*

The close of 1938 also saw the end of the P. and O. passenger liner *"Naldera,"* of 16,000 tons, which was taken to Bo'ness for breaking up. The *"Naldera"* was destined for the scrap-yard earlier last year, but gained a reprieve when on the completion of her last voyage in September she was taken over by the Government for the purpose of carrying the British Legion Police Force organised in connection with the evacuation of Sudetenland. Although never required for the voyage, she lay for some days in the Thames with the police force aboard.

This unique experience was one of many that befell the *"Naldera."* Previous events chiefly affected her building, and her design and purpose were changed so many times that it has long been jokingly stated that in her time she had been every kind of ship except a submarine. She was ordered from Caird and Co., of Greenock, and construction was started early in 1914. The propelling machinery installed consisted of twin-screw, quadruple reciprocating engines, taking steam from coal-fired Scotch boilers. Work on the vessel was suspended during the first three years of the War, and then the Government ordered her to be completed as a cargo ship, as vessels of that type were urgently needed. The conversion was barely completed when orders were given to convert her again for troop carrying, and this was no sooner done than still another conversion was ordered, and the vessel was gutted for reconstruction as an aircraft carrier! The War came to an end before she could be employed in that capacity, and she was then handed back to the P. and O. Line, and again reconstructed, this time to her original design. She went into regular service on the company's routes in 1920, and thus it was not until six years after her keel was laid that she finally left the Clyde.



The Canadian Pacific liner "Duchess of Atholl" approaching Prince's Landing Stage, at Liverpool. Photograph by F. Mills, Kearsley.

Famous Clyde Shipyard Closes

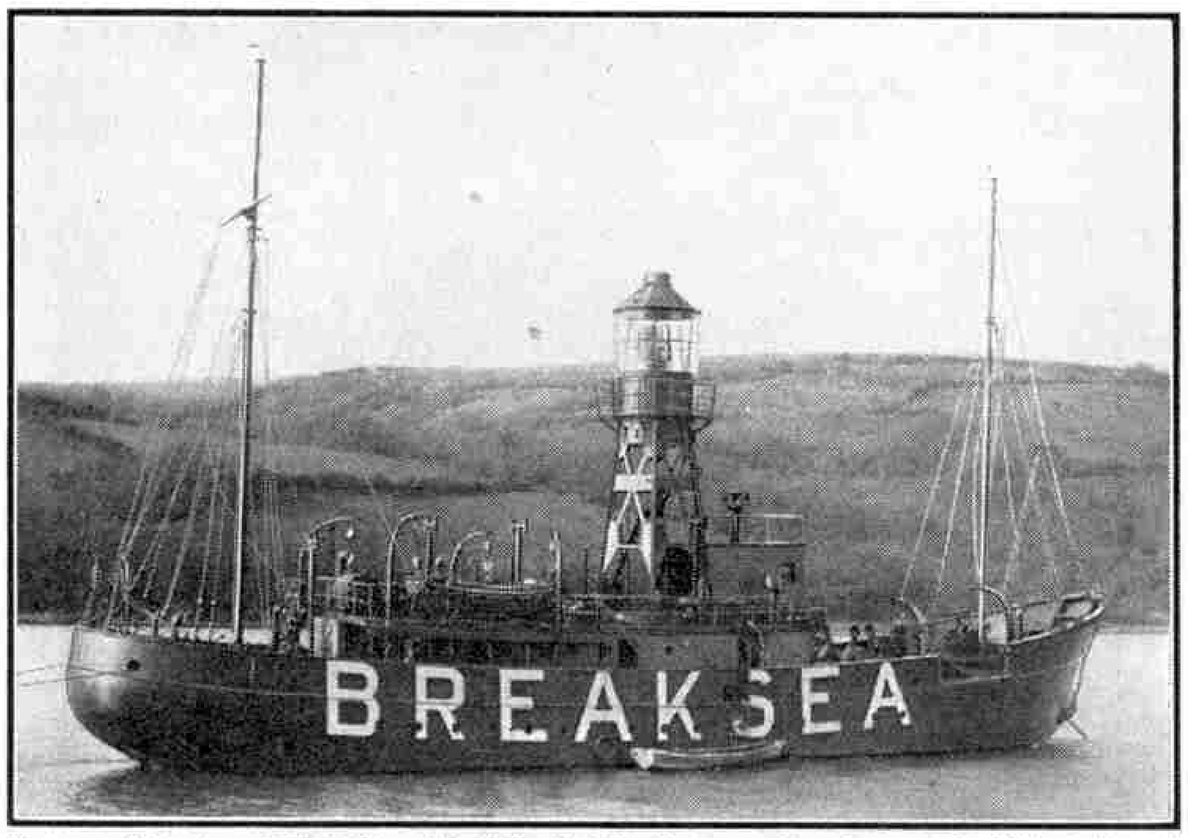
One of the oldest and most famous of the Clyde shipbuilding establishments came to an end recently, when a sale was held to dispose of the plant and equipment. The yard was at Greenock, and was established over a century ago by Messrs. Caird and Co., who turned out many notable ships from it. Four of the P. and O. company's first liners were built there when that line was founded in 1835, and from 1869 onwards Caird's were rarely without a P. and O. vessel on the stocks. They built altogether between 80 and 90 P. and O. vessels, representing over 500,000 tons gross.

The Greenock shipyard and engineering works were taken over by Harland and Wolff Ltd., in 1916. The last vessel ordered from Caird's was the P. and O. liner *"Bendigo,"* launched in January 1922, and the yard, which had been extended by the new owners, was closed during the recent depression in the shipbuilding industry.

New Light Vessel in Bristol Channel

The new *"Breaksea"* Light Vessel is shown in the lower illustration on this page. Its station is in the Bristol Channel, off the Glamorgan coast, and it is easily distinguished, for it is painted red, with the word *"Breaksea"* in large white letters on both sides of the hull. Its light is exhibited from a steel tower amidships and shows one white flash of half a second duration every 15 seconds. The light vessel also has a diaphone fog signal giving one blast of two seconds duration every 20 seconds. It also has a submarine oscillator and a radio beacon.

The new *"Breaksea"* Light Vessel was built at Dartmouth by Philip and Sons Ltd., and "Liverpool Cables" were used for all electrical wiring.



The new "Breaksea" Light Vessel built for Trinity House, under whose control it is stationed in the Bristol Channel. Photograph by courtesy of The Liverpool Electric Cable Co. Ltd.

The Life-boats' Busiest Year

The life-boat service of the Royal National Life-boat Institution broke two records in 1938. Its life-boats were launched for rescue purposes more often, and they helped to save from destruction more boats and vessels than ever before in their history of 115 years.

Altogether 27 medals for gallantry were won by life-boatmen during the year, three times as many as in 1937. Among these were three silver medals, which were awarded to the coxswains of the life-boats at St. Ives, Cornwall, New Brighton, on the Mersey, and Tenby, South Wales, respectively.

A silver medal for gallantry has now been presented to Coxswain W. H. H. Mogridge of the Torbay life-boat, while thanks on vellum were awarded to each of the seven members of his crew. These awards were made in recognition of the rescue of the two men of a crabber that dragged her anchors in a gale during December and was only 30 yds. from the cliffs, with heavy seas breaking right over her, when the life-boat came alongside in the darkness, guided by a beacon on the top of the cliffs.

Wooden Lightships Replaced

Many of the Trinity House lightships stationed round the British coast are built of wood. The Corporation recently decided to replace 23 of these during the next eight years with modern steel vessels, and three vessels of the new type have already been built and placed in service.

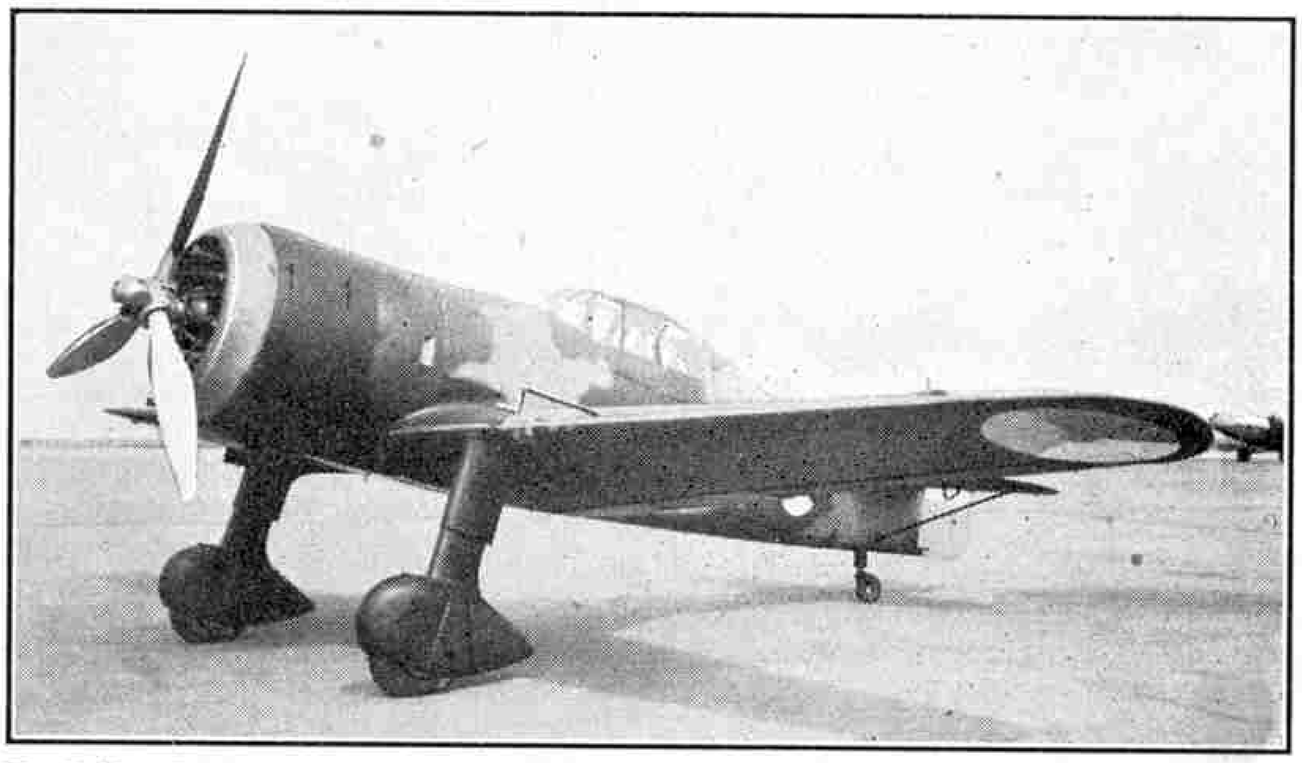
Maiden Voyage of the *"Mauretania"*

The fitting out of the new *"Mauretania"* at Birkenhead is progressing rapidly, and she will be ready for service in June. On the 17th of that month she will sail from Liverpool on her maiden voyage to New York, leaving there on 1st July for Cherbourg and Southampton. Further sailings will be made from Channel ports, with London as her home port. She will then sail from King George V Dock.

Fokker Fighters and Bombers

Height Record Made By Single-Seater Fighter

THE Fokker company of Amsterdam dates back to the early days of aviation, and the aircraft produced by this firm have long been noted for their high efficiency and reliability. Fokker aircraft are now built under licence in 16 countries and are in daily use in 30. The types produced are as varied as one would expect of a company that caters for the private owner, air line operator, and Government military departments. On the commercial side the aircraft range from two-seater trainers to four-engined monoplane air liners, the largest of which can accommodate up to 56 passengers by day and 28 by night. The military types produced range from single-seater fighters and reconnaissance seaplanes to twin-engined landplane and seaplane bombers.



The Fokker D.21 single-seater fighter with which a new Dutch altitude record of 37,250 ft. was achieved on 3rd September 1938. The illustrations to this article are reproduced by courtesy of N.V. Nederlandsche Vliegtuigenfabriek Fokker, Amsterdam.

Two typical Fokker military landplanes are the D.21 single-seater fighter and the T.5 long-range bomber described in this article. A Fokker D.21 was used by Mr. Leegstra, one of the Fokker company's pilots, when he attacked the Dutch altitude record on 3rd September last. The record then stood at 33,400 ft., the height achieved by Flight Lieut. J. R. W. van Hoogland in a Fokker D.17 single-seater fighter on 18th January 1935. Leegstra surpassed this feat by climbing to a height of 37,250 ft. The D.21 he flew was one of a series of normal Service machines, without any special arrangements for the flight, and it carried a full military load. Usually such record-breaking attempts are made with the aeroplane carrying only the minimum essential load.



Mr. Leegstra, the Fokker company's pilot who made the record flight in the aeroplane shown in the upper illustration on this page.

The D.21 is used by the Air Forces of Denmark, Finland, and the Netherlands. This sturdy looking single-seater fighter has been designed and built in accordance with the requirements of modern warfare, and is a formidable aeroplane. It can be used very effectively to attack raiding bombers, for diving attacks on ground targets, and for home defence, and can be flown easily in all circumstances and in any attitude. Its flying qualities are so good that the pilot can devote his full and individual attention to the purpose of the flight. It is designed to be armed with four guns, the types and arrangement of which depend upon the type of engine selected. Thus the armament may consist of four machine guns, a pair mounted in each half of the wing, or two in the wing and two in the fuselage synchronised to fire through the airscrew; while two 20 mm. cannons may be fitted in the fuselage, instead of the two synchronised machine guns. The triggers and levers for operating the machine guns and cannons are attached to the throttle lever to the left of the pilot.

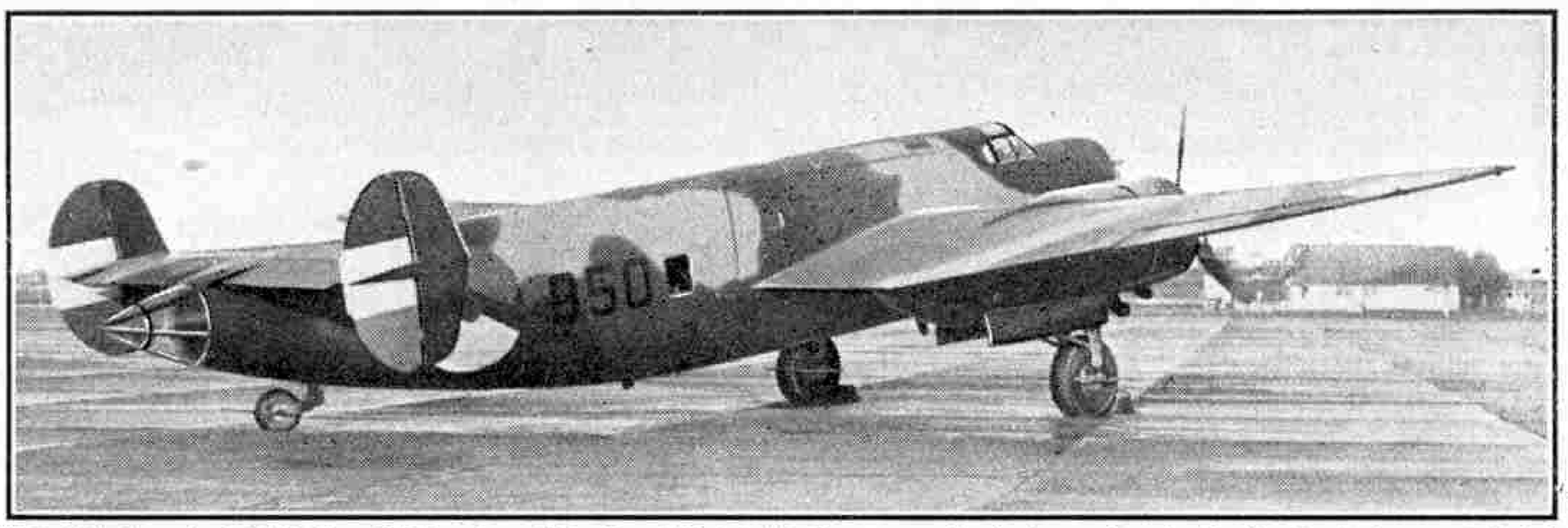
The D.21 is a cantilever low wing monoplane constructed on the usual Fokker lines, with the wing built up of two box spars and plywood ribs, with a Bakelite plywood covering. Ailerons made of steel tubes and encased in fabric are fitted to the outer portions of the trailing edge of the wing, and split landing flaps on the same edge extend over the whole length of the centre section between the ailerons.

The fuselage is a welded tubular steel structure, and from the nose to the trailing edge of the wing it is covered with duralumin panels that can be removed for inspection of the framework. The top half of the rear part of the fuselage is also covered in this way, and the bottom half with doped fabric. The enclosed and roomy cockpit is in line with the trailing edge of the wing, and has large windows that ensure a good view for the pilot. The entrance is very large, and in an emergency the entire roof can be flung off. The usual instruments and the blind-flying equipment are suspended in shock absorbers, and are indirectly lighted. The cockpit equipment also includes a radio set, chart locker, and an electrically-heated oxygen mask for use when flying at very great altitudes. The undercarriage is of the fixed type.

The aeroplane can employ any type of air-cooled or liquid-cooled engine of 600–1,000 h.p., and its performance varies of course according to the type of engine fitted.

When equipped with a Bristol "Mercury VIII" it has a top speed of 270 m.p.h., and the service ceiling, with this engine, is 31,160 ft.

The T.5 long-range medium bomber is the latest heavy military aeroplane produced by the Fokker company, and a series of these formidable aircraft has been supplied to the Royal Dutch Air Force. The Force experimented last year with "shadow-shading" their aircraft, and the first to be camouflaged in this way was the T.5 illustrated on this page. In designing the T.5 special attention was given to obtaining an efficient arrangement of the equipment and armament, and to ensuring that even when flying at a high speed the aeroplane would be easily manœuvrable; and the result is a fast and well protected long-range bomber.



This "shadow-shaded" Fokker T.5 bomber of the Royal Dutch Air Force was the first aeroplane in the Service to be camouflaged.

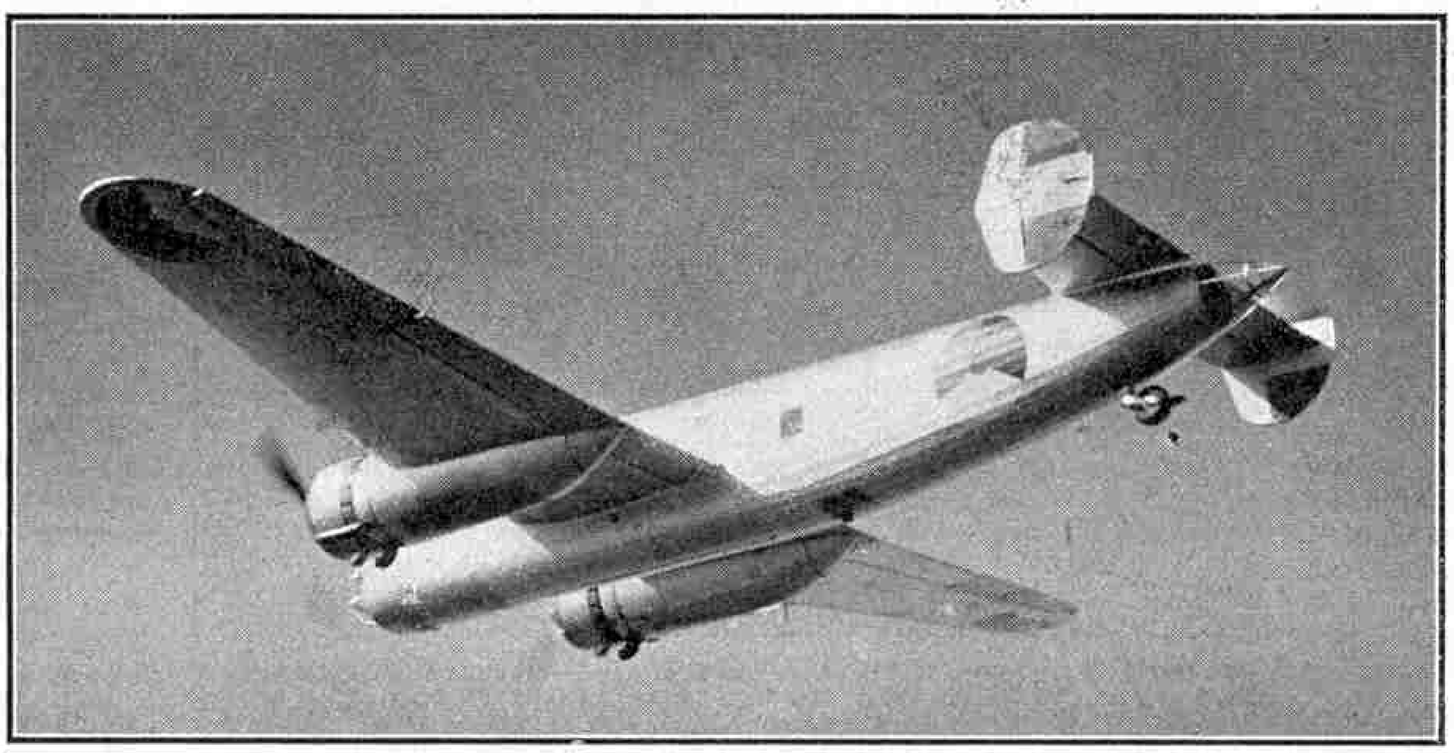
The crew total five, and consist of the commander, who is also the navigator and bomber, the pilot, second pilot or gunner, and rear gunner. The commander occupies the transparent turret that forms the deep nose of the fuselage. It can be equipped with a 20–25 mm. calibre automatic gun, or either one or two machine guns, and its occupant has a very extensive field of fire. The maps, camera, bomb release switch box, bomb sight, navigation and communication controls are also within his reach. The bombs are suspended in a bomb room under the wing, inside the fuselage, and the compartments are closed by hydraulically-operated trap doors, the position of which at any time is indicated in the pilot's cockpit.

The first pilot occupies an enclosed cockpit that is higher than the nose turret and is just in front of the leading edge of the wing, a position that gives him a clear view forward and on both sides. It is specially equipped for long-distance flights and for blind flying. The adjustable seat is placed on the left-hand side so as to leave a clear passage on the right to the places occupied by the other members of the crew. Part of the transparent roof of the cockpit can be cast off in the event of a bad forced landing.

Directly behind this cockpit, and above the wing, is that for the second pilot. In it there is a complete set of steering controls and flying instruments, so that in case of emergency he can take over the controls from the first pilot, and at the same time disconnect the main controls in that pilot's compartment by means of a hydraulic locking device, if necessary. His main duty, however, is to defend the aeroplane against attacks from above, behind and from the sides. A machine gun is mounted in the cockpit for the purpose, and there is a hydraulically-operated windscreen that when open protects the gunner from the airstream. If he desires he can disconnect his navigating controls, so as to give him more room when working his gun. When the cockpit is not being used for gun action it is closed by a sliding transparent roof.

The radio operator's position is in line with the trailing edge of the wing and is directly behind the rear spar, to which the radio set is attached. He may also be required to act as a gunner, and a little to the rear of where he sits there is a trap door in the floor and provision for two machine guns for firing downward and to the rear. There are also special openings in the side walls to permit him to fire to the left and to the right.

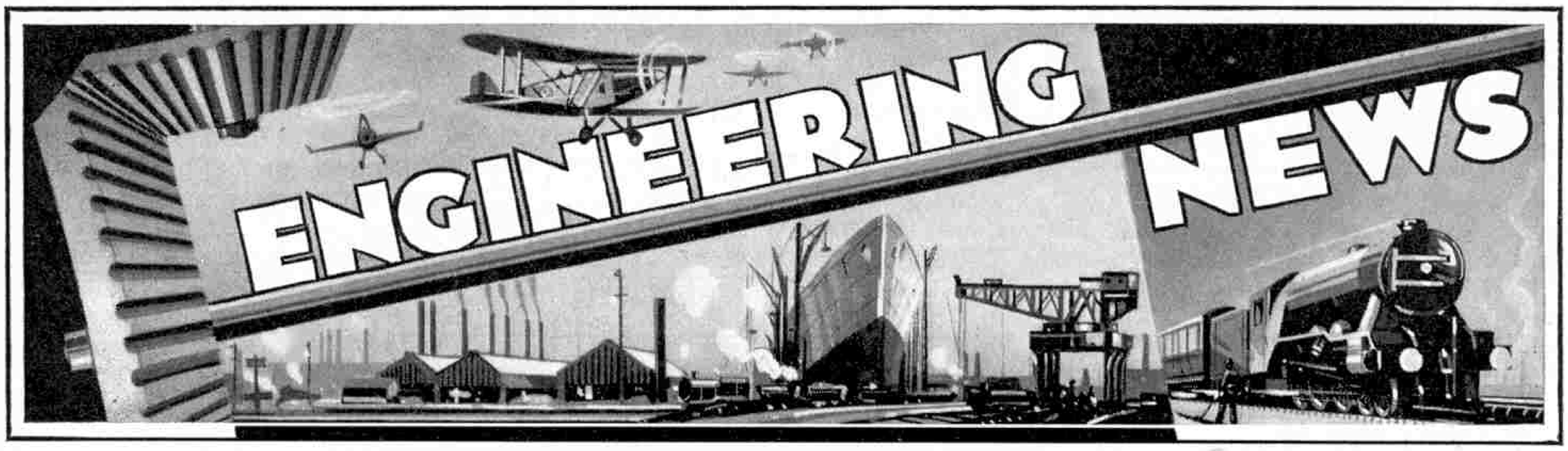
The rear gunner occupies the stern of the fuselage where a machine gun is mounted in a conical transparent turret. The walls of the aft section are padded to protect him. When he wishes to fire he pushes the gun outward through a slot, which is closed again when the gun is withdrawn. As the turret can turn a complete circle and the machine gun is mounted on gimbals, the gun can be operated irrespective of the position of the turret, and the gunner can sweep a complete semi-circle to the rear of the aeroplane. In an emergency, however, the turret can be thrown off.



A T.5 long-range bomber in the air. This view shows the middle wing form of construction and the conical turret that forms the pointed stern.

The accompanying illustrations show the Fokker T.5 to be a twin-engined middle wing monoplane. The wing is a one-piece structure of normal Fokker design, and of course is fitted with ailerons and split flaps. The fuselage is in three sections, the forward and rear ones of metal, and the centre one of wood and forming part of the wing. A wide, twin-rudder tail unit and a retractable undercarriage are fitted. The undercarriage wheels are drawn up hydraulically into the engine nacelles, and the openings then closed to preserve the streamlined shape of the nacelles.

Any type of air-cooled aero engine of about 800 to 1,000 h.p. and of normal construction and size can be fitted in the T.5. When fitted with two Gnôme Rhône 14NI engines the T.5 can attain a top speed of 276 m.p.h. The greatest height to which it can climb with this type of engine is 28,865 ft.



Handling Baggage on the "*Queen Mary*"

In order to avoid confusion, and to speed up the work of loading or discharging passengers' baggage on the "*Queen Mary*," the special conveyor shown in action in the illustration on this page is used. The conveyor was made by Herbert Morris Ltd., Loughborough, and is of the wood slat type. It is fitted with wheels, and when required for use is simply run out on to the quay and hoisted into connection with the doors in the ship's side by one of the quayside cranes. The man in charge then presses a button, which sets the conveyor belt in motion, and baggage placed on this is carried in a steady and rapidly moving stream. The belt is electrically driven and can be started or stopped from either end.

There is none of the usual confusion and congestion caused by processions of men and trucks passing up and down gangways between the quay and the ship, and the work is carried out smoothly and methodically, the activities of the workmen being concentrated mainly on checking or stowing the baggage as it enters or leaves the ship.

Lightning Protection for the World's Greatest Building

One of the problems that had to be solved by the architects and engineers responsible for the construction of the Palace of the Soviets, Moscow, which will be the world's tallest building, is that of protecting the great structure from lightning. After experiments lasting over two years it has been decided to use metal plates "earthed" to the main steel skeleton of the building for this purpose. Similar arrangements are also being made to protect the 300 ft. statue of Lenin that will crown the structure.

Until the building is completed and the permanent protection plates are in place a balloon carrying an "earthed" cable will be sent up to an altitude of nearly 2,000 ft. to intercept all lightning discharges.

Giant Bending Press

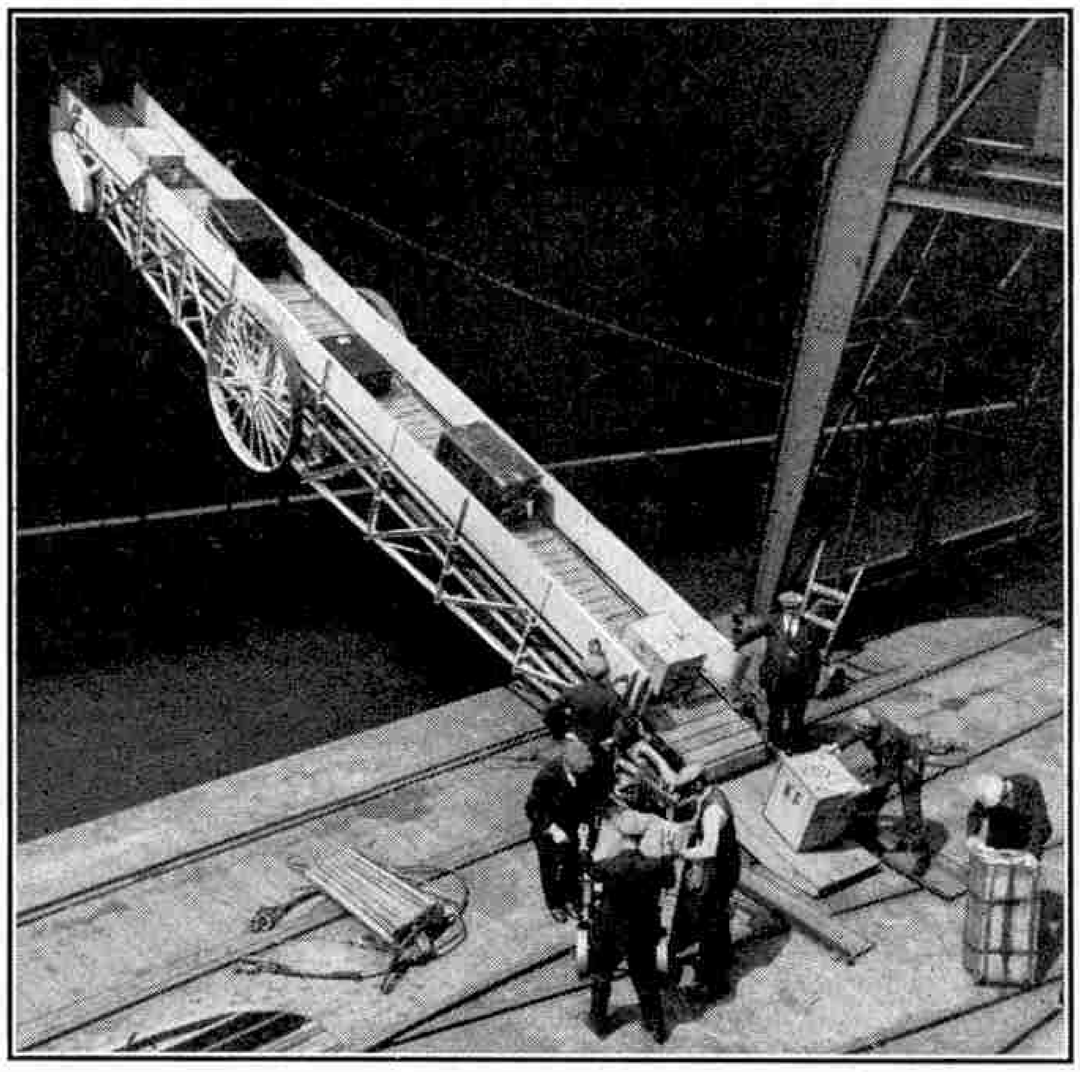
A twin-bending press, which is believed to be the largest of its kind in the world, both as to size and capacity, has recently been built by the Baldwin-Southwark Corporation of America. It exerts a pressure of 6,000 tons and can accommodate plates up to 40 ft. in length and 8 in. in thickness. It bends these plates into semi-circular shape for use in making high-pressure drums for boilers and chemical plants.

The press actually is a combination of two specially designed vertical presses each capable of exerting a pressure of 3,000 tons, which are connected by steel bending beams 52 ft. long, 15 ft. deep and 20 in. thick. The total weight of the machine is about 890 tons.

A Fine Russian Tramcar

One of the world's finest tramcars is now to be seen in the streets of Moscow. This is of the single deck type, and has a graceful streamlined all-metal body nearly 50 ft. in length. It will carry a total of 150 passengers, seating being provided for 52.

The vehicle is fitted with power-operated double doors at the back and in the centre, and a single door at the front. The door at the back is used by passengers boarding the car, and the others by passengers alighting. By means of electric heating apparatus the interior of the vehicle is maintained at a comfortable temperature even in the severest frosts, and all the windows are fitted with electric wiping and heating devices to prevent frosting in wintertime. The car travels at a maximum speed of 38 m.p.h. and is said to be free from vibration and almost noiseless in motion.



The special Morris portable conveyor described on this page unloading passengers' baggage from the Cunard White Star liner "Queen Mary." Photograph by courtesy of Herbert Morris Ltd., Loughborough.

New Belgian Canal Nearing Completion

The new Albert Canal, between Liège and Antwerp, Belgium, on which constructional work has been proceeding for the past eight years, is now nearly completed and is expected to be in full service within the next few months. It will replace an existing canal and will shorten the route between Liège and Antwerp by 18½ miles. Ships using it will pass through only six locks instead of 23 as on the present canal, a feature that will result in further considerable saving in time. Another advantage of the new canal is that its route lies entirely in Belgium, whereas the old canal passes into Holland at one point in order to avoid high ground.

The Albert Canal is about 77 miles in length and has a general width of 85 ft. 4 in., with a channel depth of approximately 16½ ft. In some parts it is carried through cuttings 210 ft. deep, in the construction of which over 31,000,000 cu. yds. of earth and rock had to be excavated. At another point it is carried along the line of the old canal between flanking walls of reinforced concrete, which actually create an aqueduct with a water level nearly 24 ft. higher than that of the old waterway. In order to withstand the pressure of the water these two great walls are underpinned by 4,300 reinforced concrete piles sunk deeply into the earth.

The canal is crossed by several fine bridges. With the exception of three drawbridges at Antwerp, these are of the fixed type and allow sufficient clearance for any boats of up to 1,350 tons capacity that are likely to be passing along the new waterway.

Blackwall Tunnel

The London County Council have decided to construct a second tunnel under the Thames, about 800 ft. downstream from Blackwall Tunnel. The present tunnel was opened about 40 years ago, and its 16-ft. roadway and narrow footpaths have long proved inadequate for the greatly increased volume of cross-river traffic. The new tunnel will have a roadway 20 ft. wide and will cost about £3,000,000. It will be used only by south-bound vehicular traffic, north-bound vehicles and pedestrians being restricted to the existing tunnel.

Mobile Television Aerial Unit for the B.B.C.

The upper illustrations on this page show a new mobile television aerial unit that has been constructed for the B.B.C. for use in connection with outdoor television broadcasts. The vehicle carries the aerial equipment and cables, and is fitted with a four-section extending ladder capable of extension to a height of 80 ft., from the top of which the aerial is suspended. The ladder is permanently mounted above the roof of the van, and the vehicle is provided with four screw jacks to give stability when the ladder is erected. Rungs are provided in the top section of the ladder only, as the aerial and cables are attached before the ladder is extended to its full height.

The body of the van is steel panelled and at the centre of the near side is a special door 3 ft. 6 in. wide, which is hinged at the bottom so that when opened it forms a ramp for rolling cable drums in or out, and for loading or discharging other items of the equipment. The door is opened and closed by means of a light steel winding cable operated by a handle from the outside of the vehicle. The chassis is of the forward control type fitted with a petrol motor of 65 b.h.p.

The vehicle was built by Merryweather and Sons Ltd., London, the well-known firm of fire-engine manufacturers.



The new mobile television aerial unit recently placed in service by the B.B.C. The aerial is suspended from the top of an extending ladder, which is shown fully erected on the left. Photographs by courtesy of Merryweather and Sons Ltd., London S.E.10.

A Brilliant New Electric Light

A 1,000-watt mercury lamp that is no larger than a cigarette, yet is designed to attain a brilliancy equivalent to about one fifth that of the Sun's surface, has been developed in the United States. The light is emitted by a highly concentrated electric arc stream that is not much wider or longer than an ordinary pen, and is approximately 12 times as brilliant as that of the incandescent filament of a standard projection lamp having a capacity of 1,000 watts.

The new lamp consists of a small quartz tube, inside which is a tiny bore that contains a globule of mercury and a trace of the rare gas argon. The ends of the quartz tube are capped with brass ferrules that provide the electrical contacts. Very high pressure and great heat are developed, and it has been necessary to provide a water-cooling system. This is in the form of an ingeniously designed water jacket, which surrounds the gleaming lamp.

Drilling America's Hardest Rock

One of the most interesting mines in the world is the Soudan iron mine of the Oliver Iron Mining Co. on the Vermillion Iron Range near Tower, Minnesota, U.S.A. This mine is the oldest and deepest in the State of Minnesota, and also enjoys the unenviable reputation of having the hardest ground of any mine in America to drill and break. The rock is so hard that about 2,800 detachable drilling bits are used each day. After use they are reground and retempered in the mine drill shop and each bit is used eight times.

The materials the drills have to penetrate are chiefly rock, jasper, and ore. Of these the hardest is the jasper, which is composed of two very hard minerals crystallised together, and some idea of the difficulty of drilling the material is given by the fact that the average depth to which a drill will penetrate before requiring resharpening is only 1.77 in. while it takes a minute to drill a hole less than half an inch in depth.

Actual laboratory tests of the jasper have revealed that some parts of the material are actually harder than the steel that was used to drill it, the work being possible only because the steel is tough, while the ore is relatively brittle.

The First Mobile Telephone Exchange

The General Post Office now has the distinction of possessing the world's first mobile automatic telephone exchange, which was placed in service recently at North Weald, Essex. The complete unit is mounted on wheels and can travel to any place where its services are needed. For instance, it can be used for restoring the telephone service when a local exchange is temporarily put out of action through fire or breakdown, and also in urgent cases where some unavoidable delay has occurred in completing a new exchange.

The equipment provided enables 100 subscribers to dial calls to one another or to trunk operators at a neighbouring exchange. The unit has double heat insulated steel walls, roof, and floors, and is fitted with its own lighting and power supply. Power is supplied by two 50-volt batteries or accumulators, which are capable of driving the automatic switchgear for a week without attention. The batteries are charged either from a generator driven by the main petrol engine of the unit, or from electric mains supply if this is available.

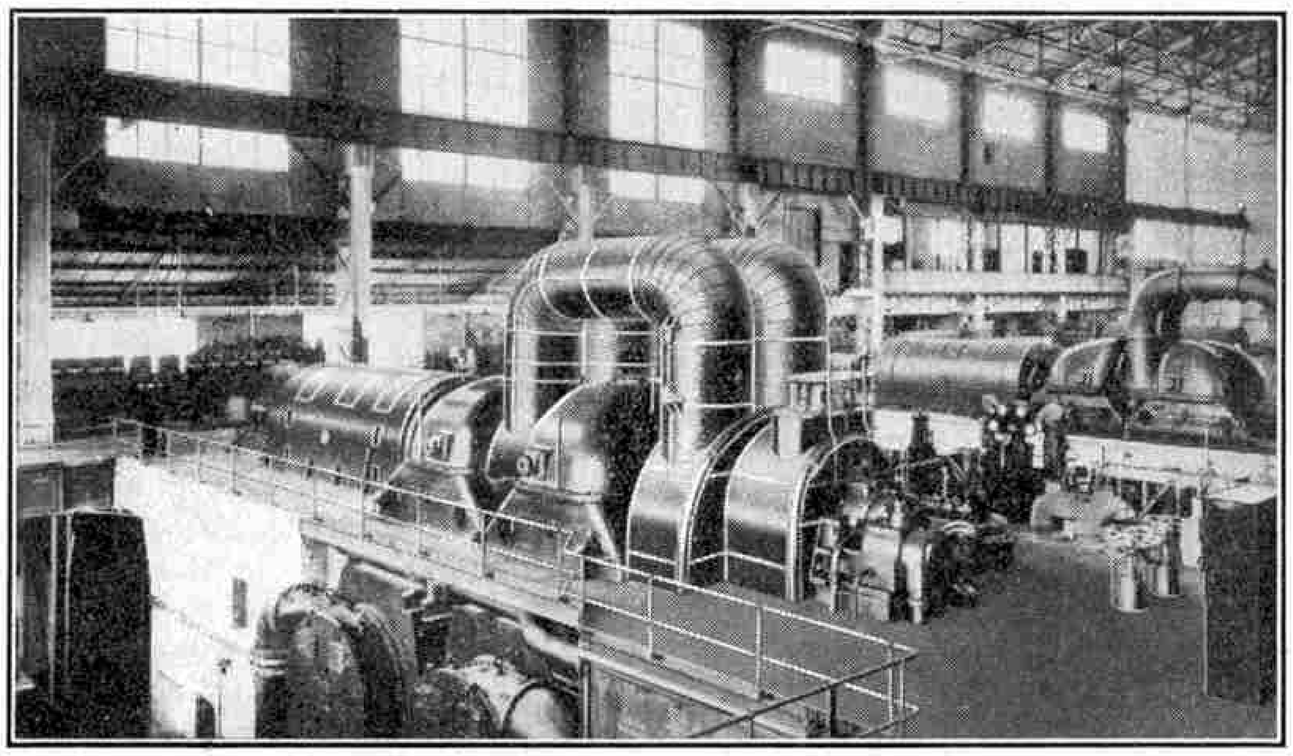
During speeches made at the inauguration of the new exchange it was stated that the experiment is an important step forward in the efforts of the General Post Office to provide telephone service when and wherever it is needed.

British Turbines for South African Power Station

An important new power station has been erected on the Klip River about 30 miles south of Johannesburg to meet increasing demands for electricity in the gold mining area. The generating plant has been constructed by Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, and consists of 16 turbo-alternators complete with steam condensers, which together produce 424,000 kW. The plant is made up of 12 main generating sets, each of which operates at 3,090 r.p.m., and produces 33,000 kW, and four smaller sets each of 7,000 kW capacity.

An interior view of the power house, showing the first three generators in position is reproduced on this page. The station is operated by the Victoria Falls and Transvaal Power Co. Ltd., and together with existing stations at Brakpan, Simmer Pan, Rosherville, Vereeniging and Witbank will bring the total capacity of the turbo-alternators operated by this Company to 820,500 kW.

The Klip River and Witbank stations are the property of the Electricity Supply Commission of South Africa and are operated for the Commission by the Victoria Falls and Transvaal Power Co. Ltd.



An interior view of the Klip River Power Station near Johannesburg, showing some of the turbine generators. Photograph by courtesy of Metropolitan-Vickers Electrical Co. Ltd.

Five Tons of Butter an Hour

A Wonderful Factory in Somerset

By T. R. Robinson

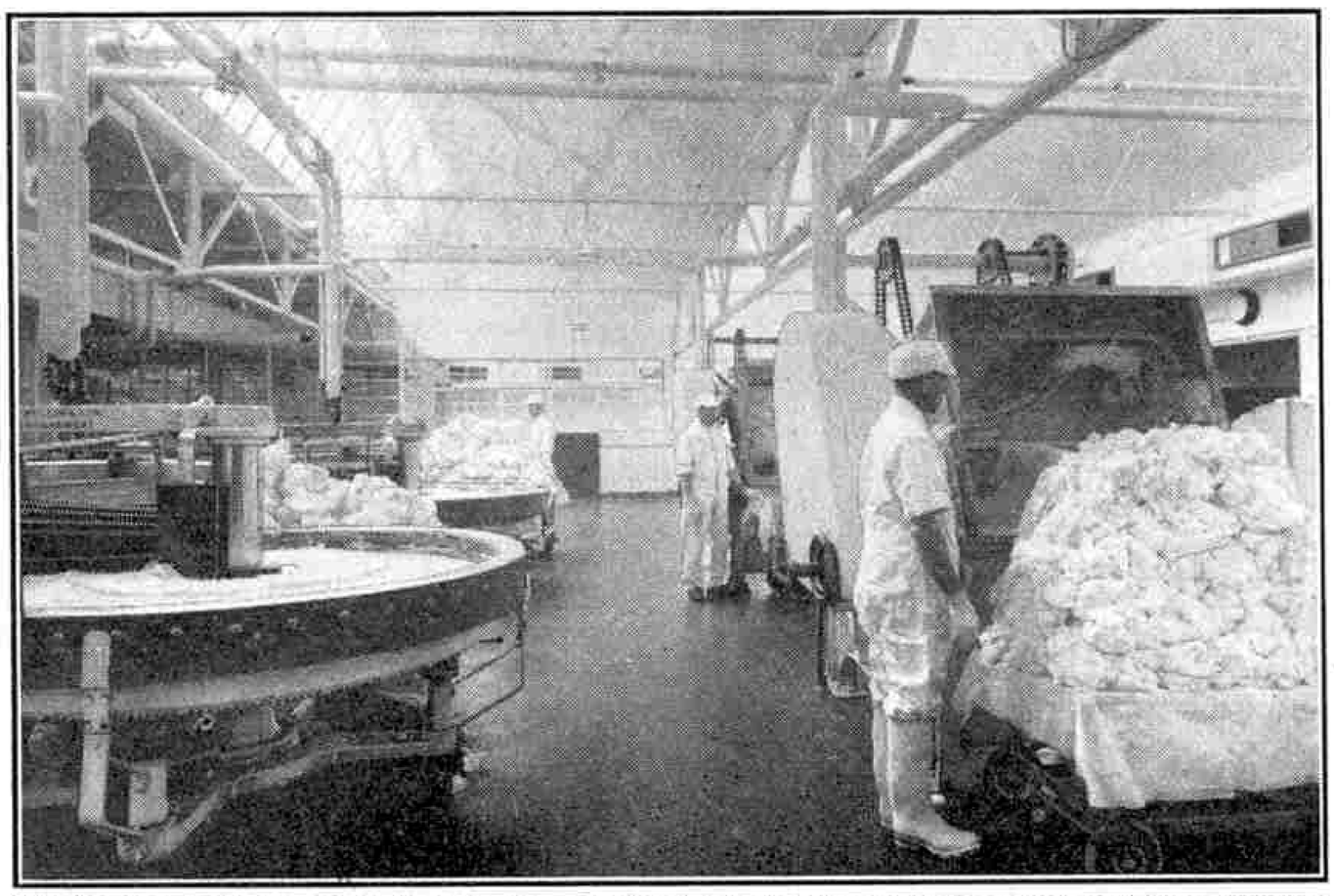
WHEN most of us think of butter we picture it being made in a country farm dairy, but in these days large creameries have replaced the older hand methods, and often produce almost as many tons in a day as a farm dairy did ounces. One of the most modern of these great butter factories is that of Wilts. United Dairies Ltd., at Yonder Hill, near Chard, Somerset, and here cream from a large area of the rich farmlands of Somerset, Dorset and Devon is used to make butter at the astonishing rate of five tons an hour.

The spotlessly clean factory buildings are planned on "flow production" lines to enable the whole of the work to proceed smoothly from the arrival of the milk and cream to the final dispatch of the butter. The first stage is the reception of the supplies from the farms. As the lorries arrive they are run alongside an unloading bank, the height of which allows the cans to be transferred without any unnecessary lifting or handling.

After the deliveries of milk and cream have been checked, the cans are placed in rows on the bank for samples to be taken. These are rapidly tested by a laboratory staff, and a satisfactory report of the quality of each must be obtained before the can from which it was taken is allowed to be tipped into the stainless-steel tanks from which the milk and cream start their journey through the factory. As soon as each can is emptied it is placed on a chain conveyor, which takes it to a special washing and sterilising plant; and after a thorough cleansing it is returned to the bank ready for loading on to the lorries once more.

The incoming supplies of milk and cream are handled in slightly different ways. The milk passes by pipelines from the tipping tanks to glass-lined storage tanks of 300 gallons capacity in the dairy buildings, and from these it is drawn as required to the pasteurisers, in which it is sterilised by heating, and to the coolers and separators. The cream, of which a considerable quantity arrives already separated, is dealt with by the cream handling and processing section; it is pasteurised on a separate plant, and then chilled before being passed to the cream ripening rooms, where it meets the other supplies of cream separated in the factory itself. The separators used in handling the production of cream from the milk arriving at the factory are arranged in a group at a point where they can deal with the milk as it is drawn from the cooler-tanks and pass the separated cream forward for ripening.

The ripening process prepares the cream for the butter churns, and the three ripening rooms are situated immediately above the churning room, to enable the cream to flow by gravity direct to the churns. Each of the ripening rooms contains a battery of glass-lined tanks in which the cream is held during this process, and all the rooms are insulated and have their temperatures accurately controlled and recorded.



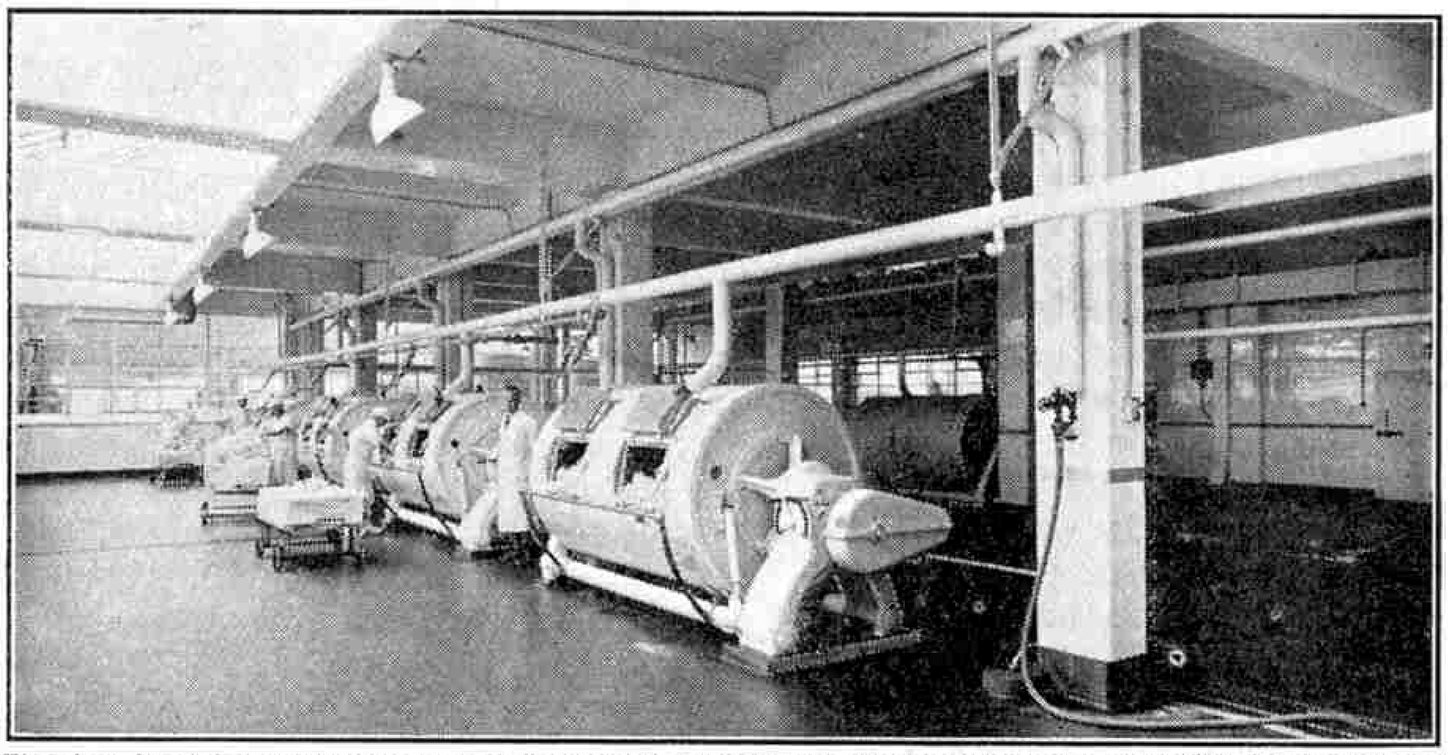
The big circular tables on which butter is passed under rollers that make it smooth and consistent and remove surplus water. The necessary salt also is added in this room. The illustrations to this article are reproduced by courtesy of Wilts. United Dairies Ltd., Yonder Hill, Somerset.

After maturing for a time in the ripening tanks, the cream is drawn off through pipelines to the churning room, perhaps the most impressive place in the factory. Lines of churns are ranged down the whole length of the room, and as each churn consists of a large white cylinder, mounted in a horizontal position and provided with its own driving motor and enclosed reduction gear, the general appearance is one of great efficiency and cleanliness. The charges of cream are fed to the churns through nozzles at the ends of pipes suspended from the ceiling, large doors with quick-action locks serving for this purpose and for the inspection and washing of the butter.

Inside the cylinder is a series of plates that serve the same purpose as those in an ordinary small churn, and as the cylinder rotates the effect is to beat the cream and cause it to form into butter in the usual way. Drain-cocks fitted in the churn walls are provided for draining off both the buttermilk and the water in which the finished butter is washed. At the start of churning, a charge of cream is introduced into the churn, the doors are locked and the driving motor is started up. About 45 minutes of churning follows, and at the end of this time the buttermilk is run off, leaving the butter granules heaped at the bottom of the churn.

The butter is next washed three or four times with water of great purity, the water being chilled to a definite temperature before use in order to give the desired firmness to the butter-mass. The washed butter is then transferred from the churn to special hand trucks through the large doors, and when each truck is fully

loaded it is run into the next processing room. Here is added the salt that is a necessary ingredient of all butter, both "salt" and "fresh," and it is placed on big circular tables, which rotate and pass the butter under a series of rollers. The object of rolling is two-fold. It converts the mass of butter granules into a smooth and consistent heap, and at the same time removes any surplus water, of which some is bound to remain after the washing in the churns.



The churning room. Each of the churns is provided with its own driving motor and enclosed reduction gear, and cream is fed into them through pipes leading from the ripening tanks on the floor above.

After rolling, the butter output of the factory divides, for different forms of packing are employed for various markets, and these call for their own methods of handling. A considerable quantity of the butter is bulked for dispatch; that is to say it is formed into slabs and placed in either boxes or casks. Butter used for catering and for manufacturing processes is largely dealt with in this way. On the other hand, butter for the domestic market is generally packeted, and sometimes cartoned as well; and this work is done in a special department by cleverly designed machines. Still another domestic demand is for rolled butter, and this form of packing is handled by skilled staff in yet another section.

The paper wrappings for the packeted butter are printed in the factory, this method being adopted to ensure that a supply of wrappers to meet the butter output is always available with a minimum of delay. Small printing machines deal with the wrappers, and for some of these two colours may be required. The printing of labels and the making of boxes and cartons is also carried out in this department.



Packing and boxing butter at Yonder Hill. The correct amount of butter for each package is cut off mechanically and wrapped by mechanical fingers.

The butter packaging machines work at great speed, and the butter, which is fed into a hopper at one end is passed through to the forming tunnel by a screw conveyor. Forcing the butter through the tunnel gives it the shape necessary for packing, and the column of butter emerges under a set of plungers mounted on a rotating head. When the correct amount of butter to make a package of the desired weight projects, a moving wire on a cutter-head severs this piece from the rest of the column, and it drops on to the wrapper, which has been fed from a stack to a rotating circular table. Then the plungers and an ingenious set of mechanical fingers fold the edges of the paper around the butter, and the package is complete. In addition to this, there is another type of machine that wraps circular packages in a slightly different way, the butter being forced into a vertical feeding channel and cut off by wires which move across horizontally. The same method of wrapping the paper around the butter is used to complete the work.

Although the machines all work with wonderful accuracy, each package is weighed as it leaves the machine, and any that do not conform to the set weight is rejected.

The packing of butter in rolls is interesting as an example of the way in which a skilled human hand can be necessary even in a modern mass-production factory. Butter for rolls is worked up by pats of just the same type as those used for butter making in farm dairies. The slab is shaped by a series of rapid movements, and then a quick forward push of a pat forms the flattened piece of butter into a roll. So accurately is the work done that roll after roll is produced without any pause, and all the rolls look exactly alike.

Once packed the butter is transferred to storage rooms that are maintained at the correct temperature to give it a firm texture, and it is kept there until it is despatched by rail or road to its various destinations.

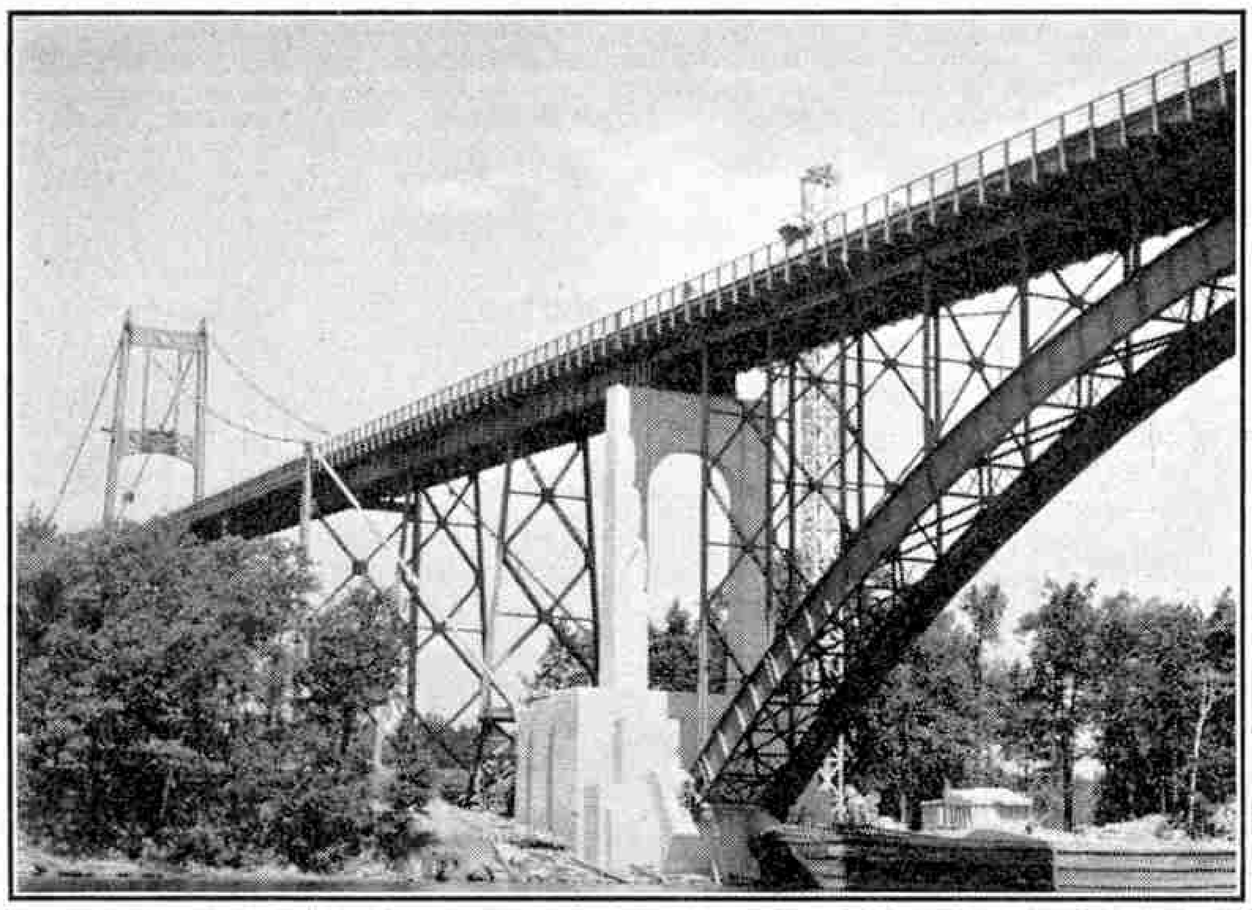
It was mentioned that the laboratory attached to the factory tests samples of the cream and milk arriving at the unloading bank. This is by no means the only test that is carried out, for samples are continually taken at all stages of production, the object being to ensure that definite standards of purity and quality are maintained. The laboratory, which is very completely equipped, is always at work, checking and testing, and no batches of butter are allowed to go forward for packing until the laboratory report has certified them as satisfactory. In carrying out this checking some 10 or 12 thousand tests of samples are made each month at Yonder Hill, and if at any stage of manufacture the sample fails to come up to the set standard, the batch from which it was drawn is rejected at once. It is only on rare occasions that the laboratory has to stop production, however, for the original check of material entering the factory, and the care taken in handling, keep milk, cream and butter in perfect condition. All the pipelines through which milk and cream pass are of stainless steel.

Spanning the St. Lawrence

New Bridge between Canada and the United States

THE fascination of bridges is not always due to size. Few of them could be more attractive than such magnificent structures as the Forth Bridge, Sydney Harbour Bridge, or the gigantic suspension bridges that have recently been completed in San Francisco Bay. Many bridges smaller than these giants are attractive because of special features, however, such as the gracefulness of their structure, or the resource and ingenuity displayed by engineers in their erection. Others again are remarkable because they consist really of a series of structures, each interesting in itself, that are joined together by viaducts or highways to make up a single unit shortening the route across some waterway by many miles or in some other way making communications easier.

A fine example of a system of bridges has just been completed in North America. This is the Thousand Islands International Bridge, which crosses the St. Lawrence River immediately below the place at which the waters of Lake Ontario flow into it. This section of the river is very wide and full of wooded islands that make a wonderful scenic attraction. It is known as the "Lake of a Thousand Islands," but the Indians had a more poetic name for it. To them it was the "Garden of the Great Spirit," and this description is one that is appreciated by those who make the Thousand Islands their summer retreat and playground.



A unique pier of the Thousand Islands Bridge, between Canada and the United States. It serves as an anchorage for suspension bridge cables and an abutment for an arch. The illustrations to this article are reproduced by courtesy of Robinson and Steinman, consulting engineers, New York.

There were many good reasons for building a bridge across the St. Lawrence at this point. One was the great need for it. The nearest bridge is at Cornwall, Ontario, 100 miles nearer the sea, and above the Thousand Islands there is no crossing nearer than the bridges over the Niagara River, at the upper end of Lake Ontario, 200 miles away. Busy ferries of all kinds ply on the waters of both lake and river, but a good road crossing was wanted in order to allow the swift and easy passage of motor cars and other vehicles.

Another reason for choosing this point was that certain islands form convenient stepping stones that the engineers could use to hold up their roadway in the air. The largest of these, known as Wells Island, is separated from the United States shore by the main channel of the St. Lawrence, which is spanned by a magnificent suspension bridge. From the Canadian shore three bridges and two viaducts are required to reach Hill Island, the second largest of the islands, and the highway built between these two sections is completed by a concrete bridge faced with granite. This bridge is only 90 ft. in length and 15 ft. above the narrow waterway that it spans, so that it seems insignificant in comparison with those forming the Canadian and American crossings. It is much more important than its size suggests, however, for the waterway beneath it divides the United States from Canada. The boundary is marked by a strip of brass embedded in the roadway, while bronze tablets on the rails at each side carry inscriptions informing visitors that they are at the international boundary. This bridge has been described as "The biggest little bridge in the world," because its length of 90 ft. connects lands belonging to two great nations.

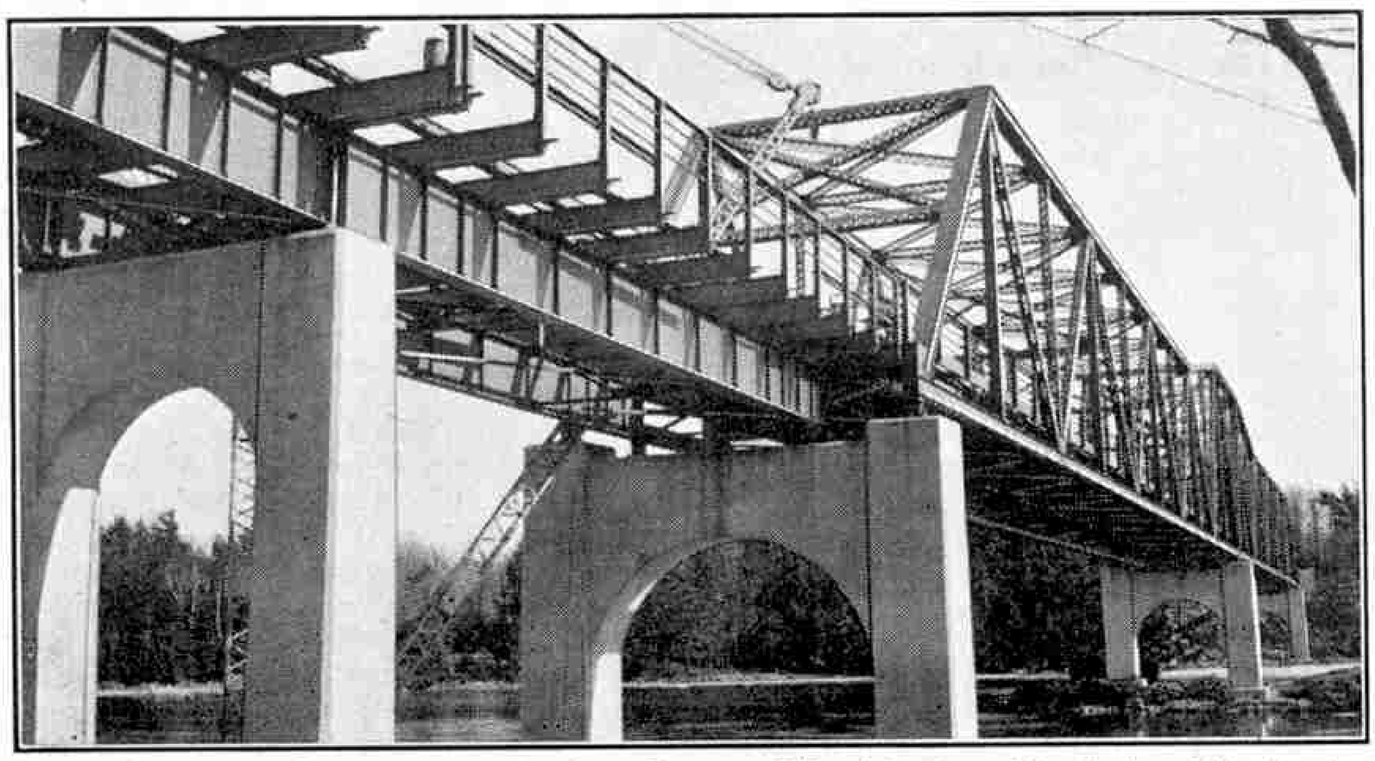
The bridge was built with remarkable speed. Construction was begun on 1st May 1937, and was expected to be completed on 1st November 1938; but actually it was opened in August 1938. Its construction happily commemorated 100 years of peace between the United States and Canada, for the last border troubles between the two countries came to an end in 1838. The opening of the great highway to traffic was made a special ceremonial occasion to celebrate a century of international peace and goodwill.

It is interesting to find that Robinson and Steinman, New York, the engineers who planned the bridge, followed the old Mohawk Trail familiar to readers of Fenimore Cooper's stories of Indian and pioneer days in North America. Only after they had decided on the course of their bridge, however, did they learn that they had chosen the path by which Mohawk Indians crossed the frozen St. Lawrence two centuries and more ago.

The bridge has a total length of $8\frac{1}{2}$ miles, although the direct distance between its ends is $4\frac{1}{2}$ miles, the length being accounted for by the skilful use made of the islands in the river which made a winding course preferable. It consists of five bridges and several miles of connecting highway. The bridges are of varying types; two are suspension spans, a third is an arch, and a fourth is a girder bridge. The fifth is the concrete structure across the International Waterway already referred to, and thus there are four different kinds of bridges.

It may seem surprising that there is so much variety in type in the bridges. Actually the entire scheme is an object lesson in the thought that engineers give to artistic and economical design, for in each case there was good reason

for the choice of bridge type to be used. For instance, on each side of one of the waterways to be crossed natural rock abutments suitable for supporting a steel arch were found, and their existence made this kind of bridge the best from the point of view of cost and construction. Similarly a small rock island in the middle of another waterway suggested building a two-span bridge; and an uncharted rock shoal discovered in the channel on the Canadian side made it economical to build a suspension span there by providing a foundation for one of the towers supporting the cables



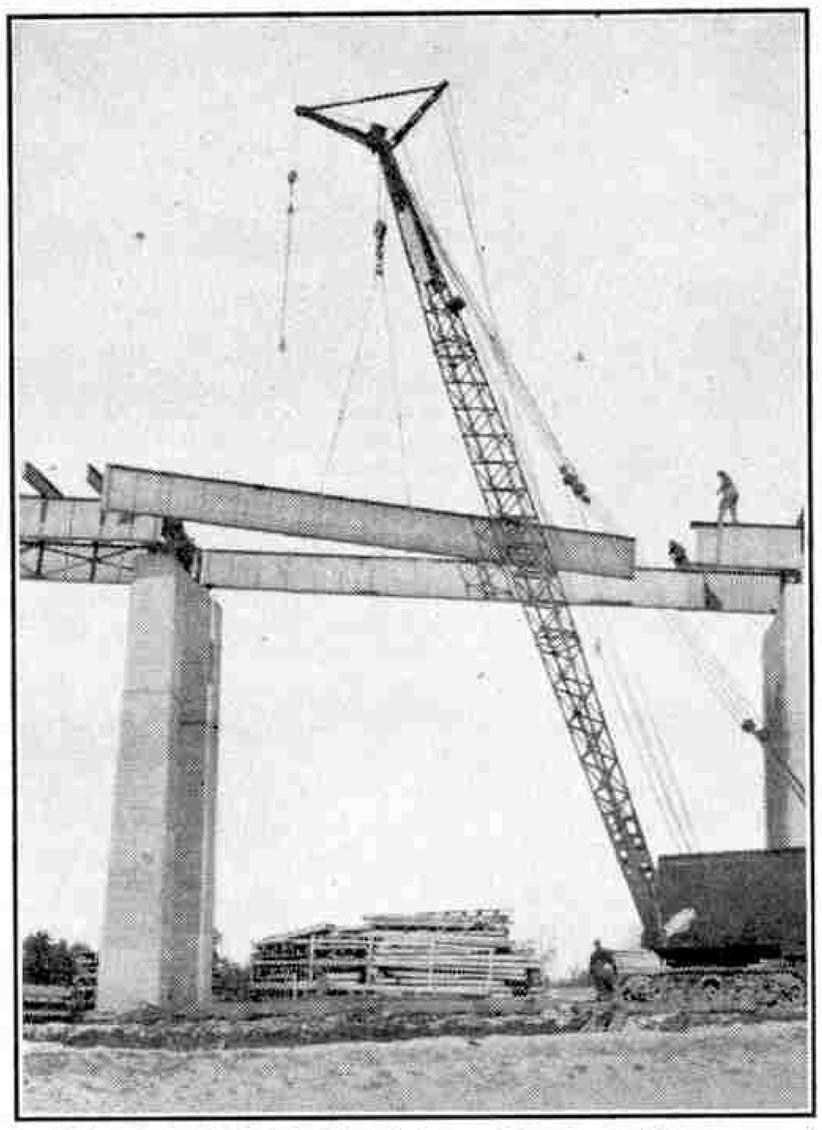
The continuous truss span that crosses the channel between Hill and Constance Islands, two of the stepping stones in the St. Lawrence used by the builders of the Thousand Islands Bridge. The central pier rests on a rock island in midstream.

Another point that had to be kept in mind when planning the bridges was that they had to interfere as little as possible with the natural beauty of the district. In addition it was necessary to allow plenty of head room over the channels used by river traffic. Both conditions were best satisfied on the wider waterways by the building of suspension bridges. These are not as conspicuous as the more massive cantilever or arch bridges would have been, and they have the further advantage that in themselves they are graceful in outline. The one arch bridge included is small and its curves harmonise well with those of the suspension bridge at its northern end. As far as possible steel girders and trusses have been avoided or kept small in building the high bridges. For instance, on both suspension bridges the strengthening of the deck is provided for by plate girders only 6 ft. deep. This also has the advantage that motorists passing over the bridges have practically unobstructed views of the scenery of the Islands.

Perhaps the most remarkable feature of this 8½-mile crossing is the succession of bridges at its Canadian end. The motorist travelling to the United States passes in turn over a long suspension bridge, a short viaduct and an arch bridge, and then crosses a second viaduct leading to a continuous truss bridge that brings him to Hill Island. In this section the engineers have taken advantage of the presence of Georgiana and Constance Islands, which mark the dividing lines between the bridges and are crossed by the viaducts providing the connections between them.

One reason for building a suspension bridge between the mainland and Georgiana Island was the presence, 240 ft. off the north shore of the island, of the shoal of solid rock already mentioned. Although this is surrounded by deep water it rises to within 17 ft. of the surface of the river. A simple cofferdam built round it allowed it to be uncovered, so that the concrete could be laid down for the south tower of the bridge. The north tower of this bridge is on the Canadian mainland and also rests on solid rock, which was reached at a very little depth below the surface of the ground and was worked by means of rock drills.

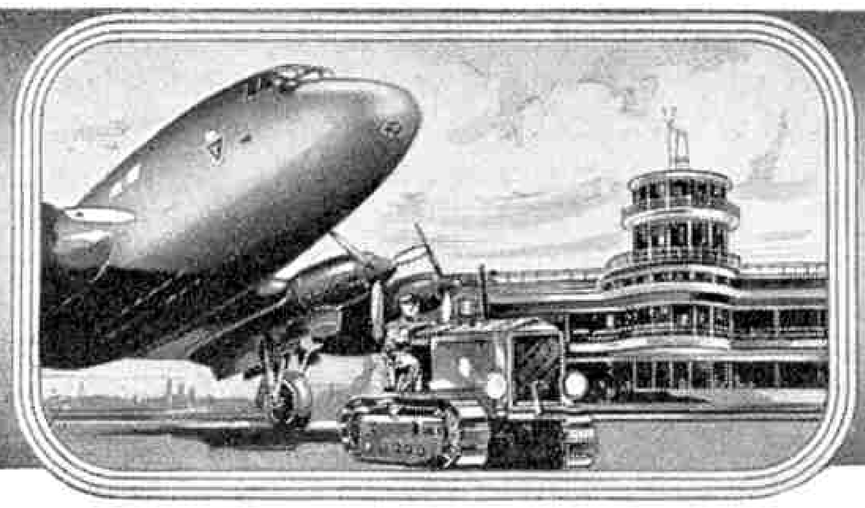
At their southern end the cables of the Canadian suspension bridge pass down to an anchorage on the south shore of Georgiana Island, and here the engineers took special advantage of the preparations that Nature herself seemed to have made for their enterprise. At this point was one of the natural rock abutments already referred to, the presence of which made an arch bridge the best kind to build, and a pier was erected that serves three purposes. Besides providing the anchorage for the cables of the suspension bridge, the pier forms the north abutment for the steel arch leading to Constance Island, and also acts as a support for the first panel of that bridge and for the viaduct span that links it up with the suspension bridge. This unique pier is shown in the illustration on the opposite page.



A plate girder being hoisted into position in building one of the approach viaducts of the suspension bridge at the American end of the new highway.

The longest of the entire series of bridges crosses the American channel, the main waterway of the St. Lawrence, and has a central span of 800 ft., with side spans of 350 ft. At each end is a viaduct 1,500 ft. in length that by easy gradients reaches solid ground north and south of the bridge respectively. These viaducts are built on a succession of steel and concrete piers, two of steel to every one of concrete.

An interesting feature of the suspension bridges is the use of a new and improved type of cable anchorage that was invented by a member of the firm of engineers who designed the project. This is believed to be the simplest and most economical form yet devised for cables consisting of rope strands. There are 37 strands in each cable, and each of these is connected to a round steel bar projecting from the concrete anchorage. The bars are set in formation to match the arrangement of the strands and the upper end of each is formed with a thread. Each cable ends in a steel socket that also is threaded, but in the opposite direction; and the connection between each strand socket and its anchor bar is made by means of a sleeve with an internal thread. The sleeves were turned to draw the sockets to the anchor bars, and after each had been adjusted in order to make sure that every strand took up its proper share of the strain, they were spot welded at their ends.



AIR NEWS

A Famous K.L.M. Pilot

The illustration on this page shows Mr. K. D. Parmentier, a famous pilot of the K.L.M., or Royal Dutch Air Lines, looking out of one of the control cabin windows of the Douglas DC-4 air liner. The photograph was taken during a recent visit to the Douglas aircraft factory at Santa Monica, California, where he watched flight tests of this huge aircraft and himself put it through its paces on several demonstration flights.

Parmentier became famous when he and Moll, another noted K.L.M. pilot, flew the first Douglas air liner, a DC-2, in the MacRobertson air race from Mildenhall to Melbourne, Australia, in October 1934. They won second place in the speed contest and first place in the handicap contest. This was a splendid achievement in view of the fact that the DC-2 was flown to a definite schedule and made 19 halts along the route in order to take up or set down passengers and mails, and that it was in competition with smaller, specially built racing aircraft. To-day Parmentier is one of the best-known air line pilots in Europe.



Mr. K. D. Parmentier, a famous pilot of Royal Dutch Air Lines, at the controls of the Douglas DC-4 air liner. Photograph by courtesy of the Douglas Aircraft Company, Inc.

Growth of Air Transport in Canada

The transport of freight by air has increased very rapidly in Canada during recent years. In 1937 the total was 13,139½ tons, as compared with 7,220½ tons in 1934, and 1,186 tons in 1931. The quantities of air mail carried also increased considerably, and in 1937 totalled 725 tons, as against 235 tons in 1931. Passenger traffic during the same period also increased, but to a less extent.

Until recently more freight was carried by aircraft in Canada than in any other country, but the report for the Union of Soviet Socialist Republics states that in 1937 about 35,000 tons of freight were carried by air, whereas the total tonnage transported by Canadian aircraft was just over 13,000 tons. A point of interest is that the corresponding tonnage for United States civil aircraft was only 3,000 tons.

The Enlarged Royal Air Force

The December 1938 Air Force List shows that at that time the R.A.F. totalled 135 squadrons, including those stationed overseas. Bomber and fighter squadrons totalled 73 and 28 squadrons respectively, general reconnaissance 17, and army co-operation 12. There were also three torpedo-bomber and two communications squadrons.

The Auxiliary Air Force is also expanding steadily, and by December last totalled 30 squadrons. This figure was made up of 11 fighter, 10 balloon, and four bomber squadrons, and three general reconnaissance and two army co-operation squadrons.

Progress of South African Airways

The winter timetable of South African Airways came into operation on 1st November last and has provided greatly augmented services on most routes. The company is now the largest air transport concern in the Dominions, and in the British Empire is second only to Imperial Airways. Under the new timetable the company's aircraft are operating over 7,430 miles of air route, and are flying a weekly total of approximately 40,000 miles. Every week there are now nine services between Durban and the Rand, and six a week between Capetown and Durban, in both directions, in addition to three between the Rand and Port Elizabeth by way of Bloemfontein, three to Bulawayo, and one weekly to Kisumu, in Kenya.

The steady development of internal air services in South Africa is reflected in the increasing total of aircraft forming the company's fleet, which consists very largely of Junkers aircraft. There are 11 14-seater Junkers Ju 52 air liners and 15 10-seater Ju 86s, and two more of the latter type will soon be added to the fleet. South African Airways have ordered two Ju 90s, and it is expected that these will be delivered by next June. Normally this type of large air liner is a 40-seater, but those for South Africa will have five roomy compartments each equipped to seat six passengers. They will be employed on the Rand–Durban–Capetown section, to carry both passengers and mails.

R.A.F. Vacancies for Short Service Pilots

The Air Ministry announce that about 400 short service commission pilots are to be enrolled from civil life during the first three months of this year. They will bring the total accepted since June last year up to 1,700, and complete the largest intake of short service officers in the history of the R.A.F. Candidates must be between 17½ and 25 years of age, medically fit, and have been educated to about School Certificate standard. They will be appointed for four years' service on the active list, followed by six years on the Reserve. A limited number of permanent commissions, and medium service commissions for a further period of five years, are granted annually to short service officers.

A short service commission in the R.A.F. appeals specially to young men of mechanical bent and with an interest in aviation. It offers a complete training in flying and a life full of interest, with opportunities of service in many parts of the world. The experience thus gained, in addition to the technical training received, proves a valuable asset when the officer returns to civil life. In this connection the R.A.F. Educational Service is always ready to advise young officers with regard to a civil career and to assist them in preparing for it, and additional educational facilities are available at practically all R.A.F. stations at home and abroad, for those who desire them.

Full particulars of rates of pay, etc., of short service commission pilots can be obtained from the Under-Secretary of State, Air Ministry (Department S.7.e), Kingsway, London W.C.2.

Origin of Names of Empire Flying Boats

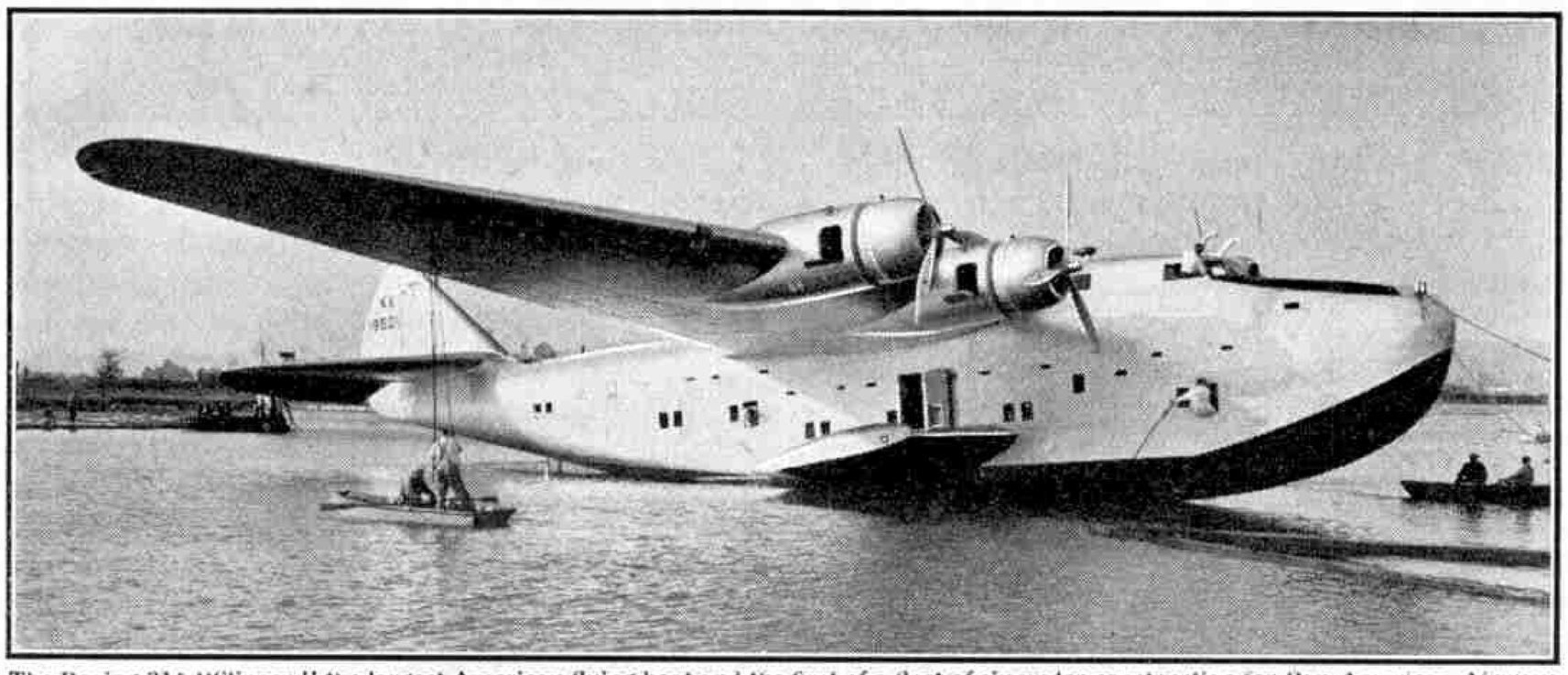
The names given to the Empire flying boats flown by Qantas Empire Airways on the Singapore–Brisbane section of the England–Australia air route are derived from original descriptions used by natives, or are the names of native places. "*Cooee,*" the name given to one of these aircraft, is a call or cry used by Australian natives, and is also the name of a seaside resort in Tasmania. The name of another of the flying boats, "*Coogee,*" is derived from that of a Sydney surf beach. This name also is native in its origin and means "mist rising from the water"; while "*Coolangatta,*" the name given to yet another of the flying boats used by Qantas Empire Airways, means in its native sense "high land overlooking water."

Two of the new strengthened type flying boats that will be used on the Australia–New Zealand service will have Maori names. One of them "*Aotearoa,*" is the Maori name for New Zealand, and means "the long white cloud"; the other, "*Awarua,*" is a native description of the two arms of a harbour at the extremity of South Island used as a landing-place for canoes.

Record Christmas Empire Air Mail

More Christmas mails were transported by air over the Empire routes of Imperial Airways last year than ever before. During the six weeks ending 20th December a total of 197 tons of air mail left this country for various Empire destinations, and 65 tons, or practically one-third of the total, were destined for Australia and New Zealand. There were 46 tons of air mail flown to India and 35 tons to South Africa, and other places to receive Christmas mail from England by air were Egypt, Rhodesia, Kenya, Tanganyika, Nyasaland, Zanzibar, Hong Kong, and the west coast of Africa.

The "last minute" rush was so great that Imperial Airways had to put into service as mail carriers every aircraft they could spare and in addition had to seek outside help. A Douglas DC-3 of Swissair and D.H.86s of Wrightways and of Olley Air Services carried some of the later mails. Imperial Airways had four of their "Ensign" and two of their "Frobisher" class aircraft on the job, and *"Mercury,"* the upper component of the Mayo composite aircraft, conveyed heavy loads of mail non-stop from Southampton to Alexandria.



The Boeing 314 "Clipper," the largest American flying boat and the first of a fleet of six under construction for Pan American Airways. Since this photograph was taken the single-rudder tail unit has been replaced by one with a triple rudder. Photograph by courtesy of the Boeing Aircraft Company.

Tokio to have New Airport

One of the problems of commercial aviation is that of establishing large and fully-equipped airports near to the centres of large cities, to replace existing airports situated many miles away and entailing long journeys by surface transport to reach them. A good example is provided by Tokio, Japan, the nearest airport to which is at Haneda and takes 40 min. to reach from the city. Plans are now in hand to remedy this by constructing a fine up-to-date airport on land to be reclaimed at Sunamachi, a suburb of Tokio. The scheme also includes the making of a road that will link the airport with the heart of the city and enable passengers to journey between the two in only 15 min. The Japanese Government have agreed to provide £175,000 toward the estimated total cost of about £700,000.

Soviet Air Service to New York

It is reported that a regular Soviet air service between Moscow and New York is to be inaugurated this year. Triple-engined air liners seating 42 passengers and carrying a crew of six are now under construction for the purpose. A series of trial flights to the United States will precede the service.

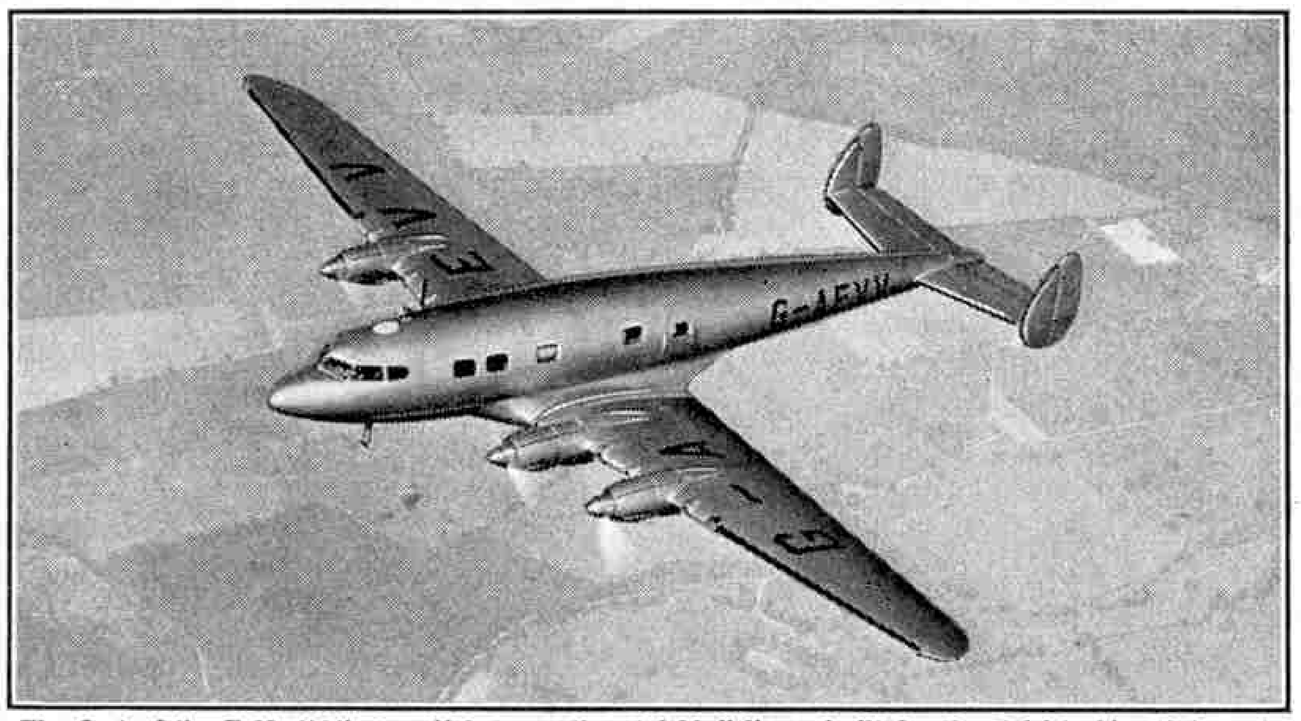
Training American Civil Pilots

A Government scheme for the annual training of American civilian air pilots was announced by President Roosevelt at the end of last year. Under this scheme about 20,000 such pilots will be trained in a year, at a total cost of about £2,000,000. The organisation bears some resemblance to the Civil Air Guard in this country, as the pilots will be trained by recognised flying schools and aeroplane clubs at reduced fees, and when qualified will be liable to be called upon for national service in the event of the country becoming involved in war.

Fine Flight by American Light Monoplane

A fine non-stop flight across the United States was accomplished by an Aeronca "Chief" two-seater light aeroplane on 30th November–1st December last. The aeroplane took off from the municipal airport at Los Angeles in the early morning, and landed at Roosevelt Field, New York, in the afternoon of the following day, having covered the 2,785 miles in 30 hr. 43 min., at an average speed of 91 m.p.h.

The Aeronca "Chief" is a high wing braced monoplane with enclosed cabin, and is produced by the Aeronautical Corporation of America. It has a top speed of 100 m.p.h. The normal cruising range is 250 miles, but the "Chief" used for the transcontinental flight had additional large fuel tanks to increase its range. The engine was a 50 h.p. Continental, boosted up to 60 h.p.



The first of the D.H. "Albatross" Intercontinental Mail liners built for the British Air Ministry for transatlantic flying this year. Photograph by courtesy of "The Aeroplane."

Camera Reveals Secrets of Bird Flight

The earliest experimenters of flight by means of heavier-than-air machines made use of artificial wings, which they attempted to manipulate in imitation of the motion of a bird in flight. The invention of power-driven aircraft opened up other lines of aeronautical research, however, and study of the technique of bird flight was neglected. Modern high-speed photography has enabled the behaviour of birds in flight to be studied in detail and at leisure, and has revealed some very interesting facts. The owl has the reputation of being the most silent of all fliers, and photographs taken of one of these birds in flight shows that the quietness is due to the long hair-like growth of the barbs of the feathers, which damps the vibration of these feathers as the bird speeds through the air. Similarly, the camera has shown how birds check their speed preparatory to landing by altering the curve of their wings and bringing their feet forward in a manner suggestive of the lowering of an aeroplane's retractable undercarriage. Another interesting fact made clear by the quick "eye" of the camera is that during the downstroke, the overlapping feathers of the wings interlock to form an air-tight pocket, and that on the upstroke they draw apart to permit air to pass between them; an interesting version in Nature of the slotted-wing principle employed in modern aircraft.

Control of Civil Flying in the United States

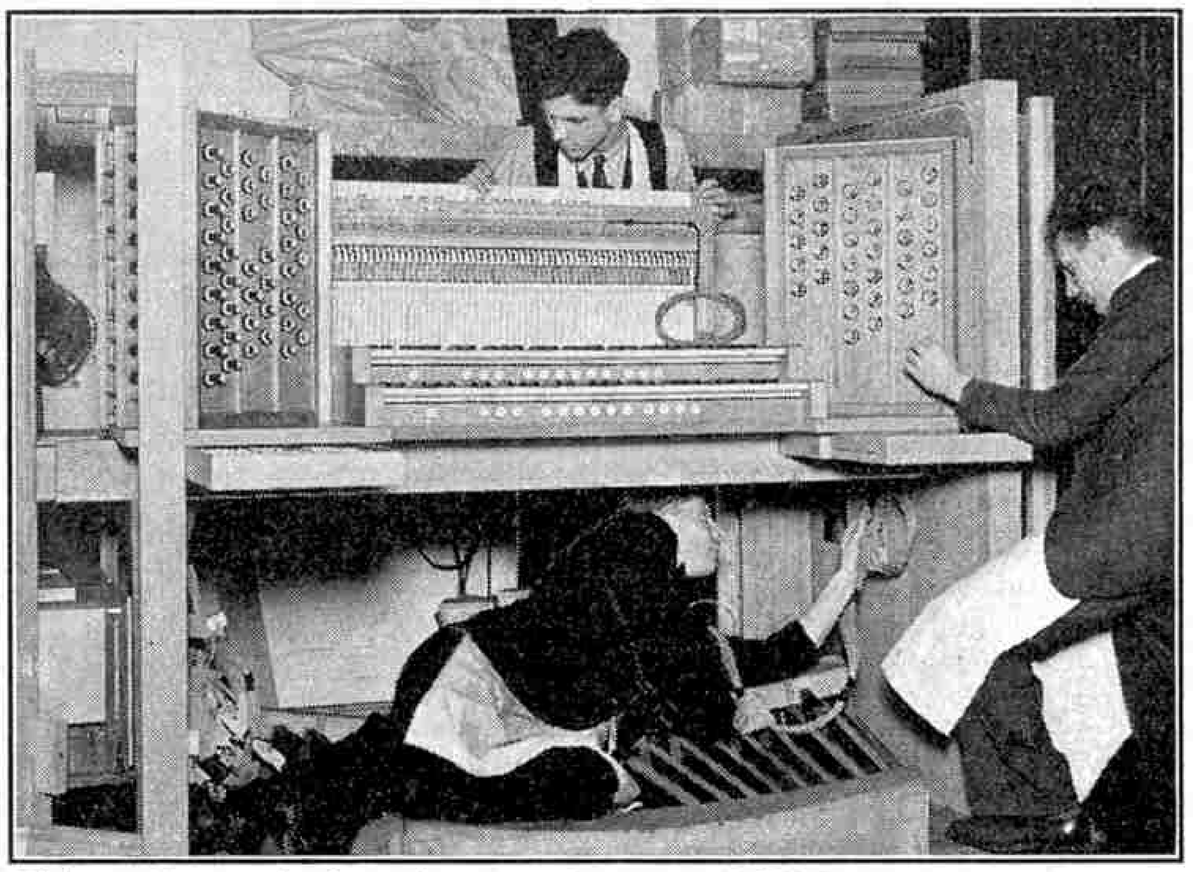
The control of all civil flying in the United States was transferred recently from the Bureau of Aeronautics, Department of Air Commerce, to a new body called the Civil Aeronautics Authority, created to promote the development and safety of civil aviation in that country. The five members who form the Authority were elected by the President and will serve for six years. The many tasks carried out under this Authority include testing and inspecting aircraft and certifying them to be airworthy. One of the most interesting aircraft yet submitted for these official tests is the prototype Douglas DC-4 air liner.

The Authority also is carrying out a detailed survey of airports in the United States, to obtain data for a report to the Government on the subject of a national airport system. An Administrator has been appointed specially to encourage the establishing of civil landing grounds and airways, and the development of air commerce.

Building a Modern Organ

How Science and Engineering Help the Musician

THE organ is a very old instrument and has a peculiar interest because of its enormous mechanical complication. It offers a remarkable example of the way in which science and engineering have gone to the help of the musician, making his task easier, and also giving him a considerably increased range of tones. In the old days, when the valves pumping the air that gives voice to the pipes were operated mechanically, playing an organ was a feat of considerable strength and endurance. The task of the organist was made easier by the introduction of pneumatic systems, but to-day electricity has been harnessed by the organ builder, and the player seated at the console of a modern instrument makes his organ sing with the lightest pressure of his fingers or, in the case of pedal notes, of his foot. He also controls stops giving every possible combination of tones by means of push buttons placed within easy reach that act instantaneously.



Wiring up the console of a modern organ. More than 10,000 electrical contacts have to be made for the playing mechanism and stop controls. The illustrations to this article are from photographs by T. C. L. Hutchinson, taken by courtesy of Rushworth and Dreaper Ltd. in their works at Liverpool.

How much patient planning and forethought goes to the making of an organ was revealed during a tour I made recently of the works of Rushworth and Dreaper Ltd., Liverpool. Each of the builders who actually carry out the work is specially skilled in some department, and all are real craftsmen, brought up to their occupations, and thoroughly understanding exactly what they are doing, whether they are building the handsome cases, completing some intricate wiring in the console, or giving voice to the pipes.

Mention of an organ brings up a vision of pipes of all sizes, and these are to be seen in various stages of construction in the works. In this country the largest, which give out the deep notes that make the floor of a great hall vibrate, are almost invariably made of wood. The trees from which the timber is cut must be enormous, for each side of rectangular organ pipes 32 ft. in length and 2 ft. in width that I saw were made of only two pieces. Where joining is necessary in constructing these rectangular wooden pipes the greatest care has to be taken to fit the two parts together exactly. Only well-seasoned wood naturally can be used in order to make sure that no difficulties will arise from shrinkage or warping.

The other pipes that go to make up an organ are of metal. Different makers have their own particular formulæ for the alloy of which they consist, but in the factory I visited two alloys of tin and lead are used. The pure metals are melted together in the correct proportions, and two men sliding a trough containing the molten alloy evenly over a prepared fabric laid down on a stone bed, move steadily along, leaving on the bed behind them a sheet of the required thickness, which cools and takes up its proper form very quickly.

It is from the sheets made in this manner that metal pipes are formed. Their shapes are legion. The most familiar is the plain cylindrical one, with the bottom end tapering to a narrow opening. These are the flue pipes, in which the sound is produced by the passage of air over lips formed by a notch in the sides. Then there are reed pipes, in which a vibrating tongue of brass produces the sound. Some of these are cylindrical, while others flare out like a trumpet, either gradually to a narrow opening or at a larger angle to give a wide bell-shaped end. Yet others combine a narrow trumpet shape with a wide air chamber, either near the reed or at their upper ends.

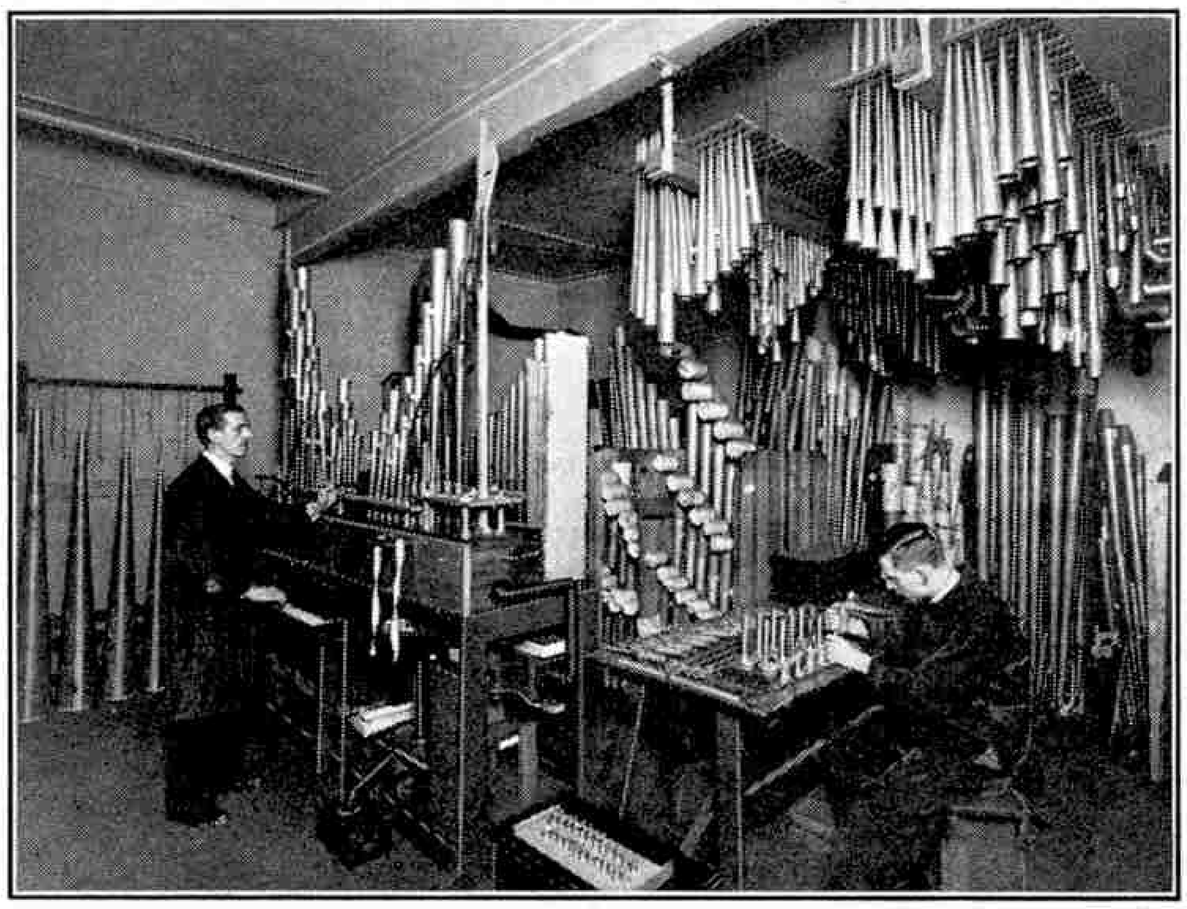


Early stages in organ making. At work on double contact breakers for use with the stop keys used on many church and concert organs.

The purpose of these variations in shape is to give character to the notes the pipes produce, and only an expert with long experience to guide him can give voices to the pipes. The quality of the tone that they produce depends upon minute adjustments, carried out slowly and conscientiously.

I watched this process in operation with reed pipes

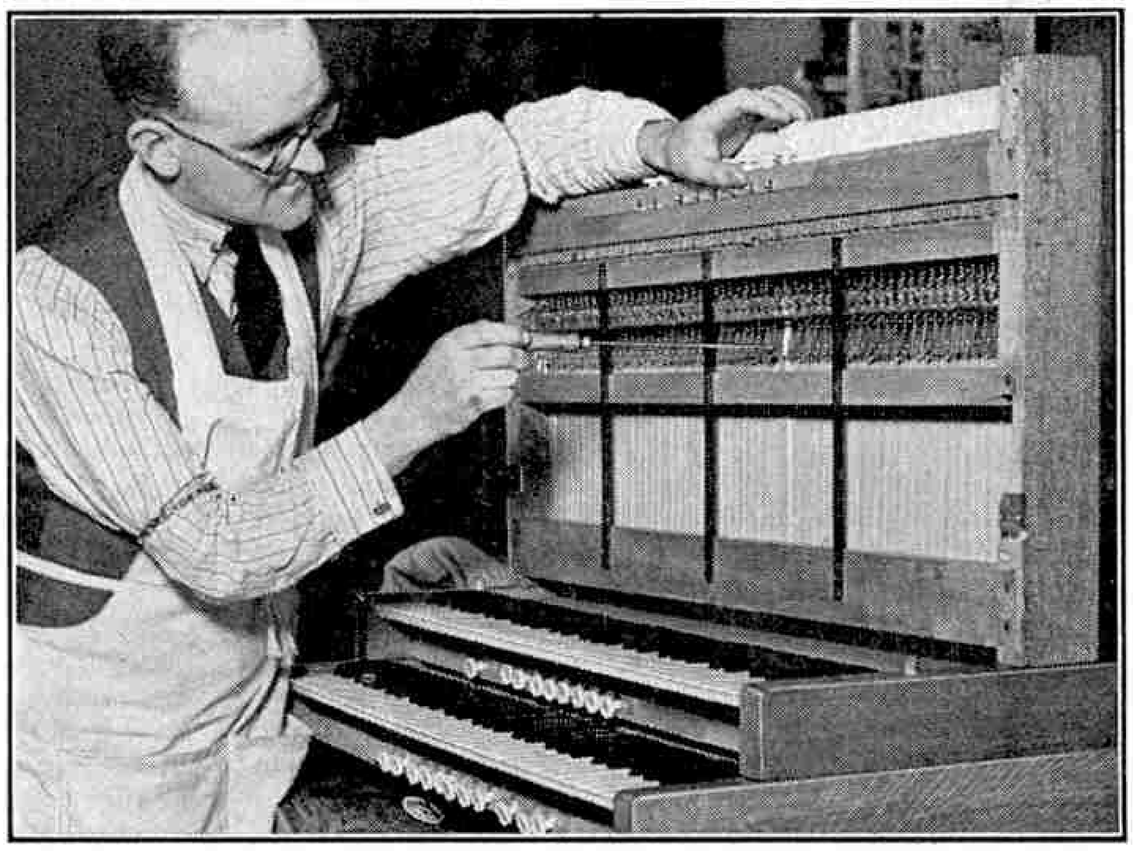
designed for an organ then under construction. In front of him the voicer has a bench on which are rows of holes on which he can place the pipes so that they can be sounded exactly as if they were in a finished organ by pressing down the keys of a manual. The voicer showed me exactly how the reed pipes work. Each fits into a brass tube, called a shallot, which is open at the bottom to allow the passage of air and has a triangular notch on the side. Over the notch fits the tongue. This too is made of brass, but no ordinary piece of the metal will serve, for that used must be springy and capable of returning immediately to shape when it is displaced. It is made with a slight curve and fixed on the side of the shallot so that in vibration it rolls over the notch. This vibration produces the sound, the pipe acting as the resonator.



The voicer at work. By adjustments to the reeds of his pipes he gives them their proper tone, and matches them ready for installing in the organ.

The curve of the brass tongue plays a great part in determining the overtones, and the art of voicing lies in producing the overtones that are wanted to give a note of the desired quality. It was here that I realised most the need for the experience and skill developed by generations of craftsmanship. I asked the voicer how long it would take me to qualify for his position, but he did not hold out any hope that I should ever be capable of doing his work!

This of course is only part of the work of building an organ. Operations in the factory proceed in much the same manner as in an engineering works. When the scope of an organ has been decided, and there is complete agreement between those who require it and its builders as to what it shall be required to do, the next step is to prepare drawings. The first of these is to the scale of $\frac{1}{2}$ in. to 1 ft., and complete detailed full-scale drawings of all the parts are then prepared for the guidance of the men who will be engaged in the various tasks.



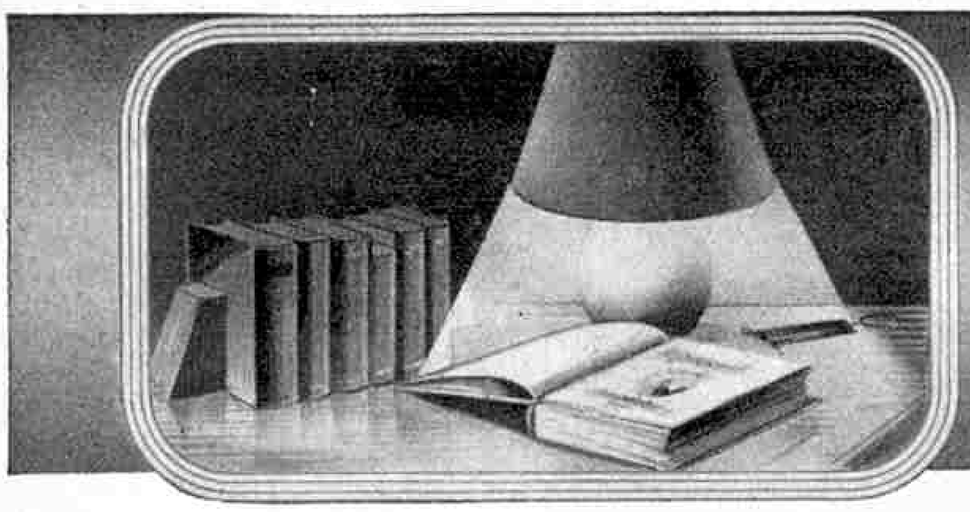
Tricky work on the manuals of a modern organ. The press buttons beneath the keys allow various combinations of stops to be switched in instantaneously.

Among these are the specialists who build the case. Carefully selected and seasoned wood only is used, and the preparation of this and the building up into the case calls for real craftsmanship of the highest order, not only in the visible portions but also within the organ itself. For instance, the louvres of the swell organ box must be absolutely accurate in size and fit, so that they shut in the sound of the swell organ completely when they are closed, and yet are capable of opening out gradually and evenly when a crescendo is required.

Interesting as these processes are, they seem almost ridiculously simple when they are compared with the building up of the console that eventually will be used to make the pipes in the great organ case sound their notes. This is a bewildering combination of electric wiring and controls that it would be impossible to describe in the course of a single article. The wires used are very fine, so fine indeed that 100 of them, each with its three-fold insulation, is squeezed into a lead-covered cable only 1 in. in diameter. In this cable the wires are wound spirally, the directions of the spirals in the successive layers alternating so that they weave over each other and there is no undue strain on one side or the other when the entire cable is bent to pass it through the casings.

It is this wiring that in the modern organ has replaced the cumbersome mechanical arrangements formerly required, and so has made it possible to remove the console to a distance from the organ itself. Pressing down the keys closes contacts and supplies current to electro-magnets that control the valves through which air is pumped to the pipes. The electro-magnetic units are small, but very carefully designed and made so as to carry out their task unfailingly, and they are supplied with current by a generator, usually of 12 volts, driven by the blower motor.

The wiring of the playing mechanism by no means exhausts the intricacies of the organ of the type I saw in process of manufacture, for the complication is increased by the addition of an electric system of stop control. With the old type of organ the player had to heave out cumbersome stops or push them back again, feats that often demanded real effort and were liable to interfere with his playing. Modern stops are electrical in operation, and it is not necessary for the organist to interrupt his playing for a moment to manipulate them, for complicated switches enable him to select combinations of stops beforehand, and to bring these into operation by the mere pressure of the thumb on button switches placed immediately below the rows of keys. In the console that I saw under construction the switches for the combinations are housed in drawers at the sides. The wiring between the controls and the solenoids by which changes are made add to the complication, and I was not surprised to learn that more than 10,000 contacts had to be made in completing the organ.



BOOKS to READ

Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/- for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

"The History of the Highland Railway"

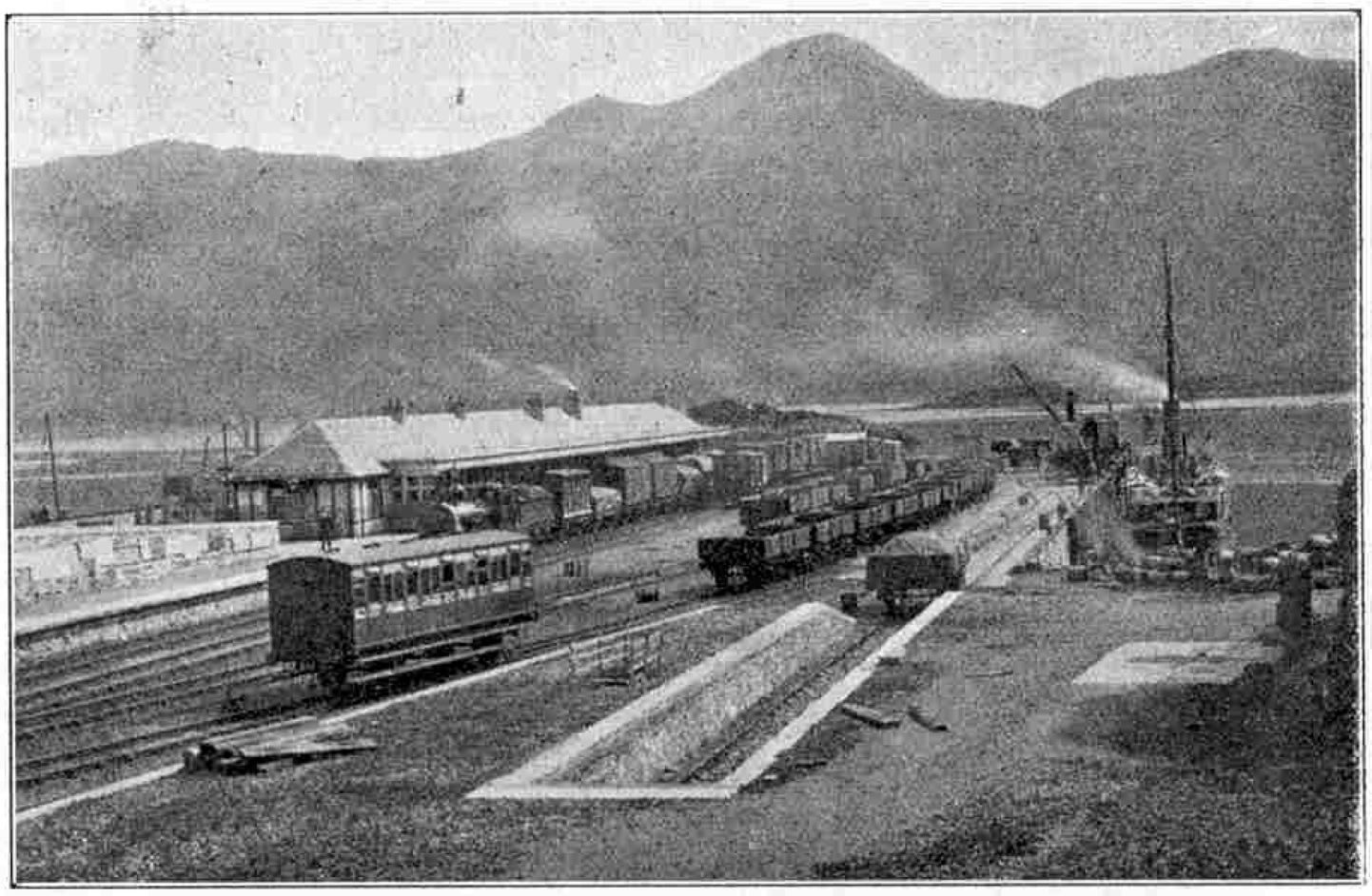
By H. A. Vallance. (Stockwell. 10/- net)

The Highland Railway, now a section of the great L.M.S. system, was a railway with a character of its own and one in which railway enthusiasts were greatly interested for many reasons. It is therefore with great pleasure that we welcome Mr. Vallance's story of its life, which is clearly based on a thorough search of every possible source of information.

We find that it was not until 1845 that a company was formed to build a railway from Aberdeen to Inverness. The former city was reached from the south in 1850, but it was 1852 before construction was begun on the proposed Inverness line, which never reached that city owing to financial difficulties, but eventually was met by one built from Inverness to Keith. In any case it provided a roundabout way of getting to the Highlands capital, and a scheme for a direct line from Perth that had been suggested by an Inverness engineer named Joseph Mitchell was then revived. Construction was begun in 1861, and four years later an amalgamation of lines led to the formation of the Highland Railway.

All these developments are clearly described by the author, who gives full details of every move, and adds interesting sections on schemes for other railways in various parts of the Highlands and the Hebrides that failed. Then come interesting stories of the working of the line, which differed from most British railways in that it was single track. The various changes in the services down to the War period and during that time are traced, and other interesting chapters deal with locomotives and rolling stock, and show how the railway fought snow on the bleak and exposed regions through which the line passes on its way across the Grampians.

The book ends with a short account of the merging of the Highland Railway with the group now known as the L.M.S., and has appendices giving the names of officials of the line, the opening dates of the various sections, and distances. It is well illustrated by photographs and maps.



A typical scene on the Highland Railway at Kyle of Lochalsh, the western terminus of the line. From "The History of the Highland Railway," reviewed on this page.

"The Microscope Made Easy"

By A. Laurence Wells. (Warne. 3/6 net)

The beginner with the microscope is liable to become disappointed when he finds that the interesting objects that he wishes to examine appear only as shapeless colourless lumps, and still more so when he reads specialist books on the microscope, which describe methods that are more suitable for the laboratory than for enthusiasts pursuing a hobby. Mr. Wells has recognised this, and has written a book that can be thoroughly recommended as a gateway to the world of minute things of all kinds for those who wish to make microscopy a lasting and fascinating pastime.

After making valuable suggestions on the best type of microscope to use, the author turns to the things that can easily be done with it. He suggests many subjects of interest under the microscope, from a cigarette card and other objects that are part of our everyday life to the scales of fish and butterflies, which can easily be mounted roughly for examination. A particularly interesting chapter deals with crystal formation under the microscope, a pursuit that will prove entertaining and attractive.

Pond life figures largely in the book, as it should do, for it includes many minute animals and plants of great interest that can readily be collected by the simple but effective methods that are here described. The beginner who has followed the author so far will have no difficulty in applying the practical methods of mounting that are described in full in the later portions of the book. There are 12 plates of typical microscope subjects and 20 line illustrations showing how to proceed to obtain the best results.

"Strange Fish and Their Stories"

By A. Hyatt Verrill. (Harrap. 10/6 net)

Fish that climb trees, fly through the air, wear armour, steal rides on other fish, shoot insects and even use a gaily baited rod and line to catch other fish, are among the many strange creatures of seas, lakes and rivers that are described in this fascinating book. Mr. Verrill certainly does not lack material with which to amaze his readers, and tells his stories in an easy and effective manner.

The author points out that empires have been built upon fish and wars have been fought over fisheries. Then he turns to the description of strange fishes, and we are given page after page of wonders. We read of such fish as the piranha of South America, a tiny man-eater only a few inches long that is more savage and voracious than any shark; and of strange associations, such as that of the pilot fish with the tiger shark, along with stories from the author's own experience of ogres and giants of the sea. Strangely misshapen fish, others that well deserve their name of butterfly fish, and the weird illuminated creatures that are to be found in the darkest depths of the ocean figure prominently, and there are many good stories in the chapters on fishes that never existed and on certain mysteries of the fish world. The fishes that never existed of course include mermaids, and among the mysteries of the fish world is the sudden and unexplained destruction of the tile fish off the United States coast in 1882, and its sudden reappearance in vast numbers 20 years later.

One of the fishes that never existed was the famous Loch Ness monster, which according to Mr. Verrill was often seen and shot at, and in the end was proved by the authorities, who dynamited and dragged the Loch, to be the remains of a German dirigible! This will be news to our readers, and the author's account makes one a little uneasy in regard to the correctness of other astonishing tales of strange fish that appear in the book. Nevertheless the volume is worthy to rank with Mr. Verrill's previous stories of strange sea-shells, insects, reptiles and birds. It is made more attractive by seven excellent full-page plates, two of which are in colour, and numerous drawings in the text.

"Science in the Army"

By A. ARMSTRONG. (H.M. Stationery Office. 6d. net)

Readers of the *"M.M."* who live in London, or are likely to go there during the next month, will be interested in the special War Office Exhibition that has been arranged at the Science Museum, South Kensington, to give visitors an idea of the modern mechanised and scientific Army. The display will be open until the end of February, and Mr. Armstrong's book has been written to explain the purpose of the exhibits and to describe how the modern soldier is trained in scientific and technical work. It should be in the hands of every boy, who will see from it that the modern Army offers a fine career, with good pay and excellent conditions to all who are keen and eager to get on.

The need for mechanical knowledge in the Army has increased out of all proportion during the past few years. Mr. Armstrong is at pains to show exactly how boys who leave school at the age of 14 to join the Army are trained as armourers or fitters, or pass through the five-year course at the Military College of Science, Woolwich. The training in all these courses is remarkably thorough.

Of other forms of Army technical training the most important is learning to drive and maintain motor vehicles .The pupils see what happens to the mechanisms, and some of the working models used in teaching them, with different parts marked in various colours, are on view at the Exhibition and are explained in the booklet. Heavy workshop repairs, tanks and other tracked vehicles, signals and wireless, air surveying and general engineering in the old Army sense are other topics that receive attention in the booklet. A special feature is made of the scientific side of air defence, and Mr. Armstrong's account deals finally with the general education of the modern soldier and the manner in which the research department of the War Office keeps the Army up to date.

There are six excellent photographic illustrations of various forms of mechanical and scientific work in the Army. The book will be a great help to all visitors to the Exhibition, and those who cannot see the display will find in it many things of the greatest interest.



An armoured car and a wireless lorry, typical examples of the scientific equipment of the modern army. The illustrations on this page are from "Science In The Army," reviewed on this page.

"Not So Useless"

By L. PATRICK GREENE. (Harrap. 5/- net)

Many readers of the *"M.M."* will remember Trooper Useless, whose adventures on joining the British South African Police were told by Mr. Greene in a previous book. Once more we see this youth in his travels in the bush, encountering wild animals and experiencing strange adventures with natives, over whom he wields remarkable influence. We follow him when making a census of the natives in his district, and admire his shrewdness. Readers cannot help liking Trooper Useless, and will enjoy this very pleasant story.

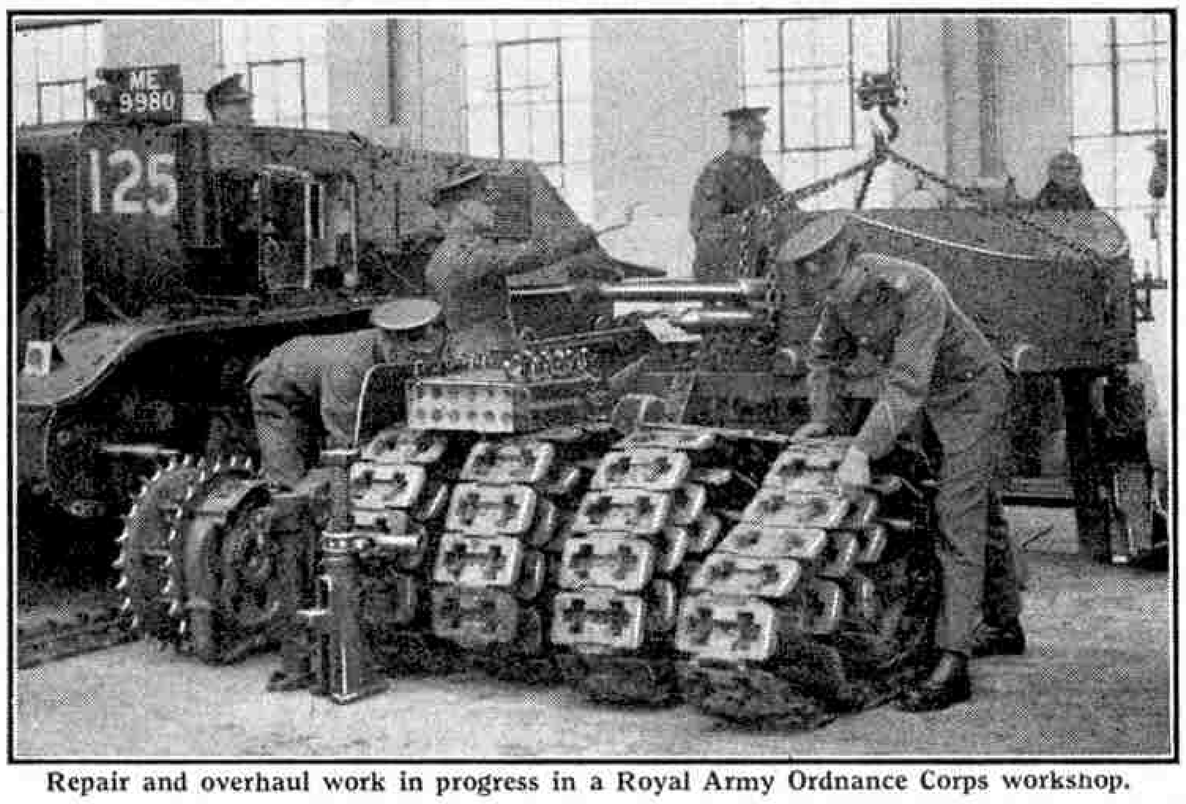
"The *Edgar Allen News*"

(Vol. 17, No. 200. 6d. monthly)

With its January 1939 issue the *"Edgar Allen News"* reaches its 200th number, and the opportunity has been taken to survey the main branches of the activities of Edgar Allen and Co. Limited, the well-known Sheffield steel firm producing it.

The articles in this issue are typical of the magazine in general. Although authentic and marked by the long experience of the production and use of steel of all kinds that the firm possesses, they are not mere technical accounts, but are written in such a manner that they are of the greatest interest to all users of steel and also to the general reader. A particularly valuable series now running deals with the manufacture of steel, the 12th instalment included in this issue describing clearly and concisely the Bessemer process. There are also articles on the production and use of tool steel, with replies to enquirers in search of special information; and more general contributions deal with the history of the typewriter and the early history of electricity in Great Britain.

The Editors of the Magazine are to be congratulated on the skill with which they have developed their magazine since the appearance of the first issue 20 years ago, and we hope that this valuable publication will continue to expand and make more records.



Repair and overhaul work in progress in a Royal Army Ordnance Corps workshop.

"Explorers Awheel"

By GARRY HOGG. (Nelson. 5/- net)

Mr. Hogg is to be congratulated on an interesting new idea in adventure yarns. The scene of this story is "unknown" country in south-west England that is explored by two boys and two girls, accompanied by a strenuous uncle, in a cycle tour the interest of which never flags from start to finish. All the places they visit are real, and the tour is one that might easily be made by readers of the book. Stirring episodes abound, however, the party helping to fight a farm fire that they themselves discover and having other exciting adventures while bathing and exploring hills and valleys. Camping is another source of great interest in the story, and readers who have spent a time under canvas will thoroughly enjoy the ingenuity that helps to make the camp life of the party more comfortable and greater fun. There are 30 sketches and maps by Mr. Hogg, together with a coloured frontispiece and 12 other full page illustrations, and this unusual and original story can be thoroughly recommended.

"Sunspots and their Effects"

By H. T. STETSON
(The Scientific Book Club. 2/6 net)

This addition to the volumes selected for circulation among members of the Scientific Book Club deals with a topic that is of the greatest interest to-day, when there is a tendency to blame sunspots for calamities and mishaps of all kinds, and generally to credit them with an important influence on human affairs in general. Mr. Stetson's book will help readers to decide for themselves how much of the things they read of sunspots is knowledge and how much is mere guess work.

The book begins by showing some very striking parallels between the growth and decline of sunspots, which take place in regular cycles, and changes on Earth. Among the things that seem to follow sunspot changes are market prices on the stock exchange, the growth of trees, the production of motor cars and of manufactured goods generally, and even the number of foxes and rabbits in the fields and woods. On the other hand crops do not appear to be affected by sunspots. Many other possible connections between sunspot activity and earthly events also are explained and discussed by the author, who warns his readers not to draw hurried conclusions. He then turns to a more scientific examination of sunspots themselves, showing how they may affect the amount and quality of the light and heat we receive from the Sun and examining their possible effects on the weather and the Earth's magnetism. How radio is affected by sunspots, and the possible influence of radio waves on the flight of pigeons are among the other subjects dealt with, and there are three full-page plates and many diagrams.

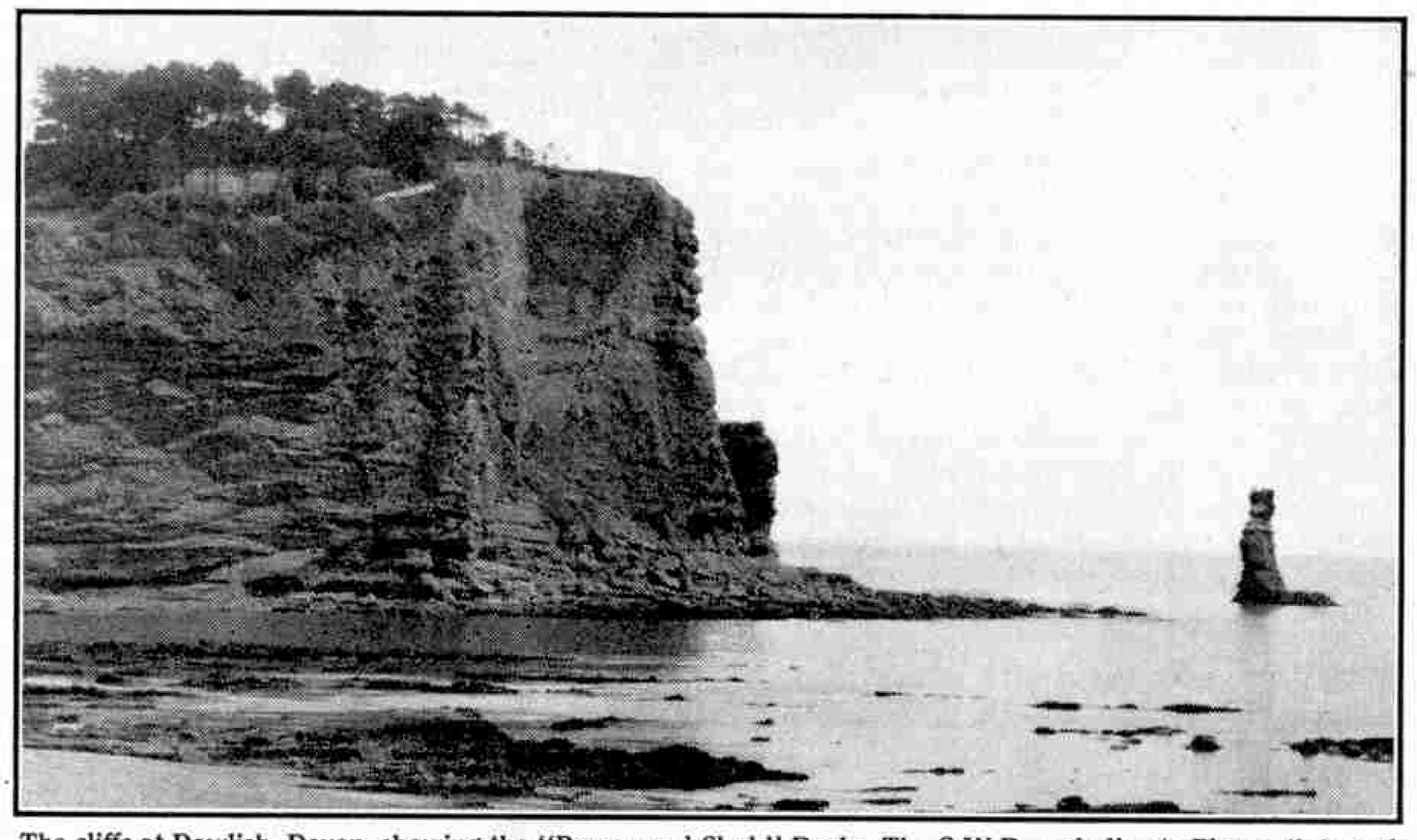
Lost Lands of Britain

Havoc Wrought by the Sea

By Sydney Moorhouse, F.R.G.S.

ALL round the coastline of the British Isles a war is being waged that is proving more expensive and prolonged than any European conflict recorded in our history books. It is a fight between the inhabitants of our seaside towns and villages, and the ruthless forces of the sea. Every winter the waves hasten on the destruction of the crumbling cliffs of the East Coast, and meadows, cottages and farm buildings slide away into the water with an alarming regularity. Almost every year the coastline of Great Britain changes in shape and more land is yielded to the ever-threatening forces of the ocean that surrounds it.

It is estimated that more than £2,000,000 has been spent in attempting to stave off the ravages of the sea in recent years. On Romney Marshes alone over £700,000 has been spent on reclamation and works, and still the land is slipping away into the sea. Scarborough has spent £150,000 on the construction of its now embattled shore, and very few holiday resorts on the south and east coasts have spent less than £100,000 on defence.



The cliffs at Dawlish, Devon, showing the "Parson and Clerk" Rocks. The G.W.R. main line to Plymouth tunnels through the cliffs at this point.

Practically every English resort practises some form of reclamation and the simplest and most common is effected by the familiar breakwaters, which can be seen on nearly every seaside beach. These act as bulwarks upon which the force of the sea can be spent, and thus make sure that when the waves reach the actual sea wall they have not sufficient strength to break the foundations. They also prevent sand and shingle from being carried away by the receding waves. It is not generally realised, however, that each yard of breakwater costs between £2 and £5 to construct, and the erections have to be renewed every 25 years or so.

At the tiny village of Reculver, near Herne Bay, two curious towers of a ruined abbey-chapel stand right on the edge of the waves, yet at one time they were more than two miles inland. Here is a striking example of coast erosion, but running almost due east from the towers is a great stretch of dyke-guarded marshland, known as the Wantsum, which was once a waterway through which the Roman galleys sailed in order to avoid the stormy passage round the Isle of Thanet. Roman forts at Reculver and Richborough guarded each end of the passage. The Wantsum endured as an arm of the sea for a long time after the Romans had departed from these shores, for there are records indicating that many of the pilgrims bound for the shrine of St. Thomas at Canterbury sailed up here when the winds were too troublesome for them to land at Dover.

The prevailing westerly winds that come blowing up the English Channel play some queer pranks with the south-east coast. Dungeness is affected by these westerly winds and every year that headland is literally "blown" nearer to the French shore. It will be a long time before we can walk across to the Continent, however, for the present rate of extension averages but 20 ft. or so a year! Nevertheless, the lighthouse has had to be moved three times within 100 years. On the other hand, Beachy Head, near Eastbourne, once lost no less than 3,500 tons in a single night.

Off the shore at Deal the Goodwin Sands now appear as a brown stain in the sea and legend tells us that in the days of Earl Godwin this place was a low and fruitful island, the whole being eventually sea-inundated in one terrific storm. Ever since then the sands have been responsible for causing numerous shipwrecks, and so valuable is the treasure reported to have been sunk there that at one time it was quite seriously suggested that concrete towers should be sunk and connecting galleries constructed in order to tap their riches.

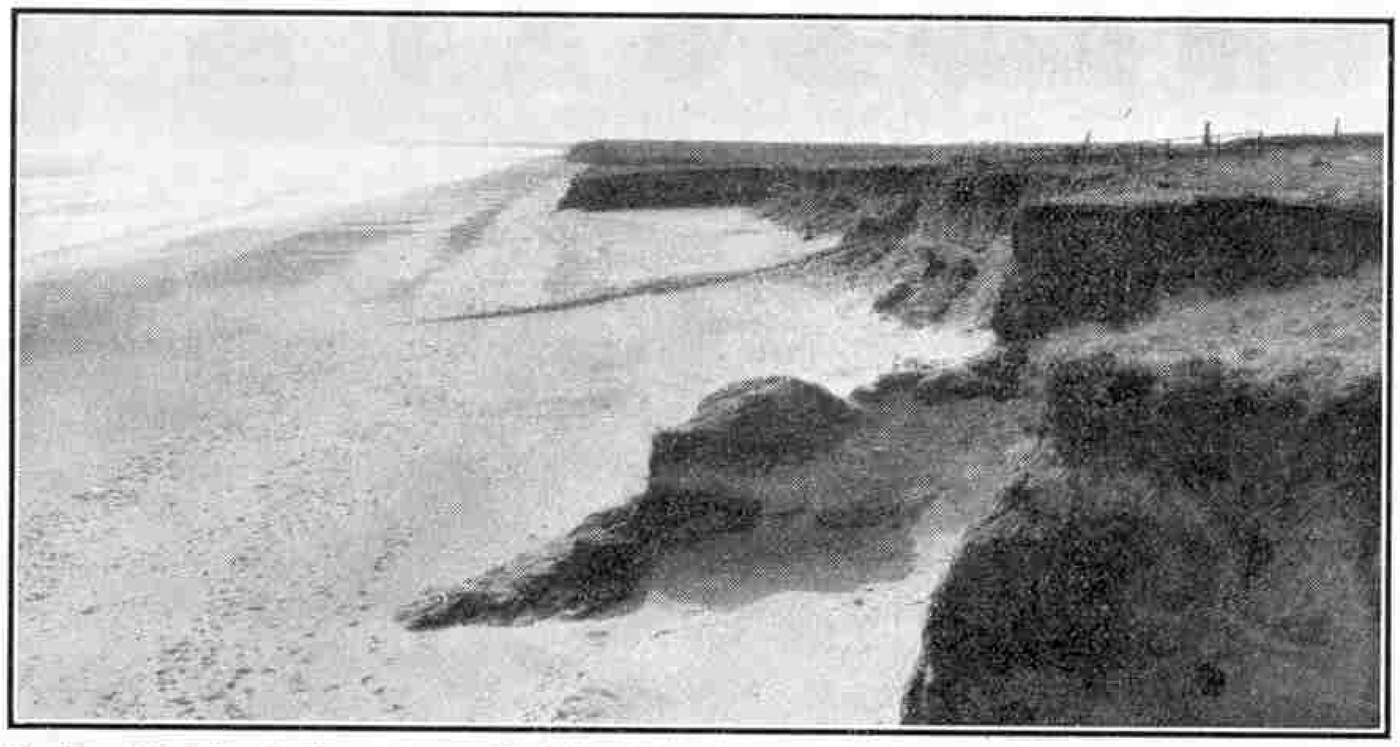
Innumerable legends speak of many similar "lost" lands off the coast of England and Wales, and many of these concern the land of Lyonesse, which is believed to have stretched from Land's End to the Scilly Isles. This is claimed to have been exceptionally rich in minerals, and it is said that about 1,000 B.C. the Phœnician traders found large quantities of tin and other metals here. Later on, both Greeks and Romans came here in search of its treasures.

Lyonesse was reputed to have been a happy hunting ground of King Arthur and his Knights of the Round Table, but just how it came to be overtaken by the Atlantic does not appear to be known. No trace of it was to be seen in the days preceding the Norman Conquest.

Much of what is now Bristol Channel was at one time a pleasant countryside, and the vast bight of Cardigan Bay also was part of the mainland long centuries ago. Tradition says that the neglect of the dykes by a drunken prince was responsible for the making of this bay, in the

same storm that engulfed Lyonesse. Actually the formation of Cardigan Bay has been traced back to a succession of earthquakes, which turned the land topsy-turvy and eventually resulted in the waves of the Irish Sea sweeping up almost to the flanks of the Rhinogs, Cader Idris, Plynlimmon, the Prescelly Hills and other Welsh mountains.

Even more unusual are the stories attached to the Lavan Sands, which stretch across the entrance to the Menai Straits between Penmaenmawr and Beaumaris. Legend states that this land was ruled over by Prince Helig, and that it went down before the relentless tide during a night of gay carousal, when the attendants of the dykes were too drunk to notice the fierce storm that was coming up.



The low cliffs of the Holderness coast, Yorkshire. The sea is eating steadily away at the coast from Bridlington down to Spurn Head, which is being built up with the material torn away farther north.

This story may be somewhat fanciful, but 30 years ago two ardent geologists took advantage of a very low tide to row out to the site of the supposed palace. Their quest was not in vain, for they actually found the ramparts of two of the palace walls still visible in the sand, suggesting that the Menai Straits once formed a rich fertile valley, a well populated region that is now surrendered to the all-conquering sea.

Submerged forests are not uncommon features on the west coast. Exceptionally low tides in Mount's Bay, off Marazion, Cornwall, have revealed traces of black trees far out in the bay, and great storms have cast trunks of these submerged trees on the shore. In ancient days St. Michael's Mount was a part of the mainland and was surrounded by a dense forest. Liverpool Bay also was a forest at one time, and at Leasowe, near New Brighton, a low tide often reveals an expanse of roots and tree trunks.

Some of the greatest land losses have been off the Yorkshire coast, and here too a great woodland area, known as the Black Forest, is now under the waves. In 1934 a sequence of freak tides revealed many evidences of the existence of this submerged forest. The inundation of the Humber basin must have been one of the most terrible disasters of its kind on record, for tradition states that thousands of lives were lost and whole towns and villages were buried for ever in the rapidly rising waters.

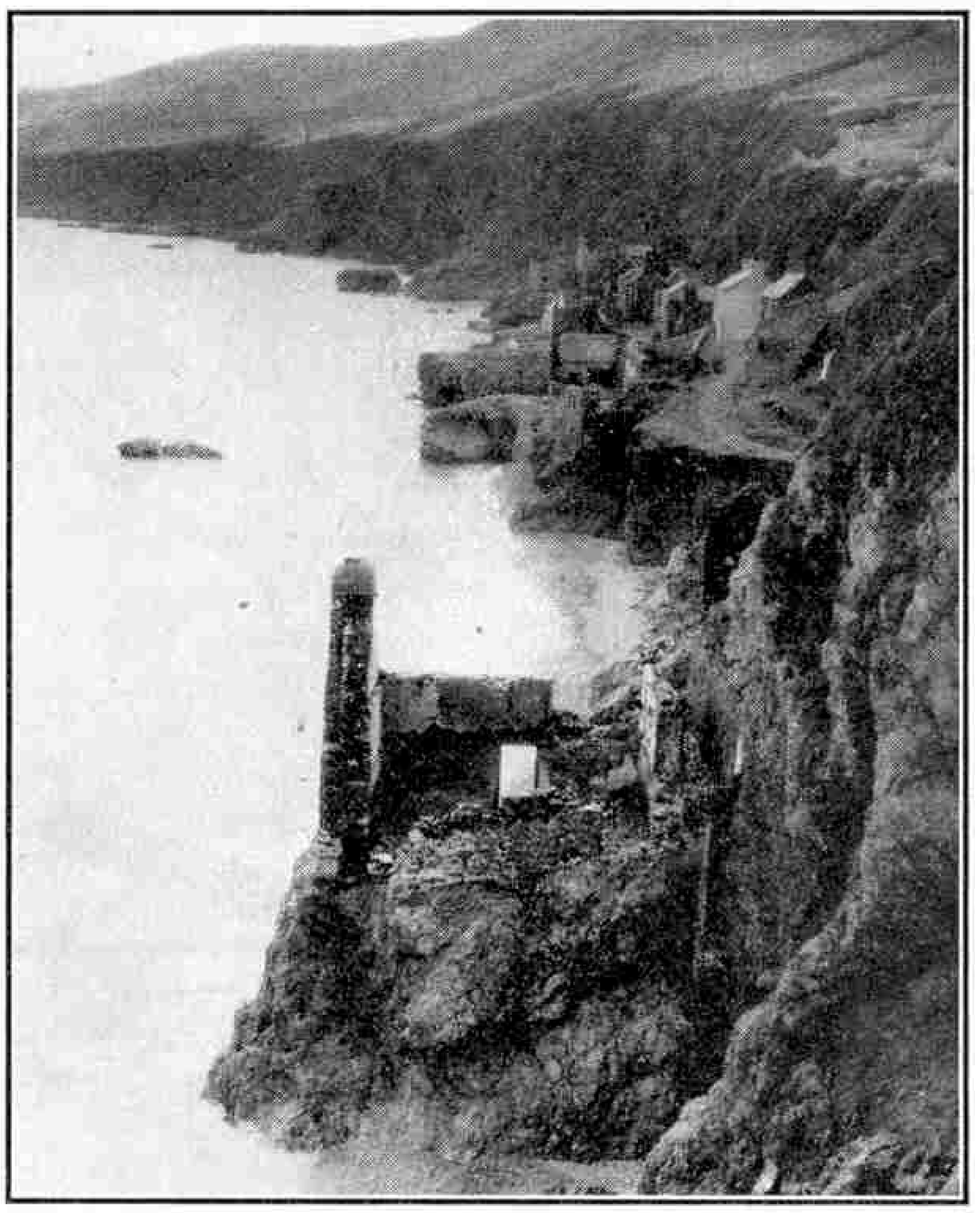
The erosion of the Yorkshire coast has continued steadily for centuries, however, and many of the towns and villages of mediæval Yorkshire are now covered by the sea. One such place is Ravensburgh, or Ravenspur, as Shakespeare calls it in his "*Richard II*," where Bolingbroke landed on the expedition that made him Henry IV. So important was this town that it had two representatives in Parliament, but it seems to have disappeared entirely in the 14th century.

Since that time the sea has continued its advance, and in 1826 someone is said to have entered the ruined church at Kilnsea, part of which had already succumbed to sea encroachments, but five years later the entire building had disappeared. There are records showing that in 1828 a churchyard existed at Owthorne; less than a quarter of a century afterwards this is said to have crumbled into the waves. Even to-day some 11 ft. of Holderness disappear each year.

The East Anglian coast has also suffered and between Harwich and Lowestoft is the sea-drowned town of Dunwich. A port of importance in the 12th century, it began to lose ground to the sea soon afterwards, and church after church crumbled under the scour of the waves. In Elizabeth's time a grant was made to the inhabitants in the hope that they would be able to provide adequate protection, but this was in vain and the town continued to slip into the sea. During the 18th century a terrible storm hastened on the destruction, and to-day little trace remains of this once important place.

In 1897 a storm inundated other East Anglian villages and further south, at Bradwell in Essex, the tiny church of St. Peters-on-the-Wall is the only part of Othona, a busy port in Roman times, which has not been yielded to the waves.

An entirely different problem from that confronting the Yorkshire and East Anglian seaside town authorities is engaging the attention of those in charge at Southport, for there the sea is gradually departing from the shore and vast sandbanks were once almost entirely under water. This shows us another aspect of the battle with the waves. For every square mile of land yielded to the sea six are added to our shores, but even so, the fight is an unequal one, for the mile lost is usually fertile and the six gained are mostly useless.



Hall Sands, a ruined fishing village in Devon. It was destroyed by the sea during a great storm.

HORNBY-DU

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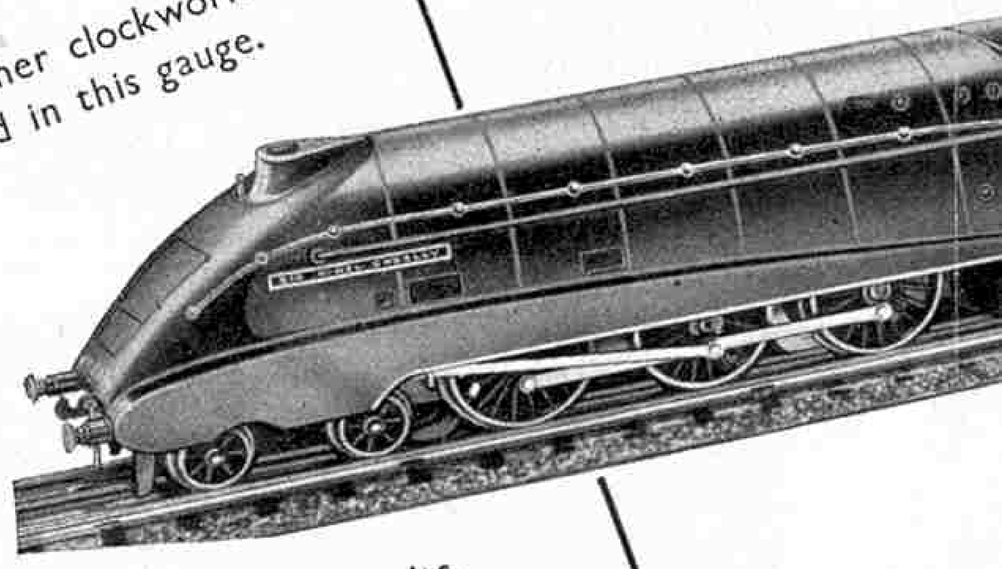
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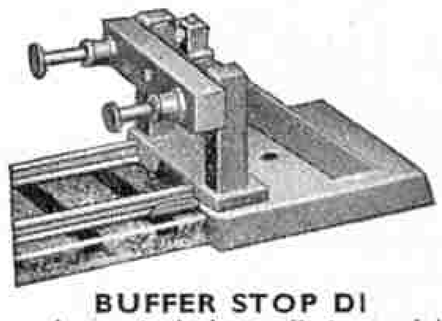
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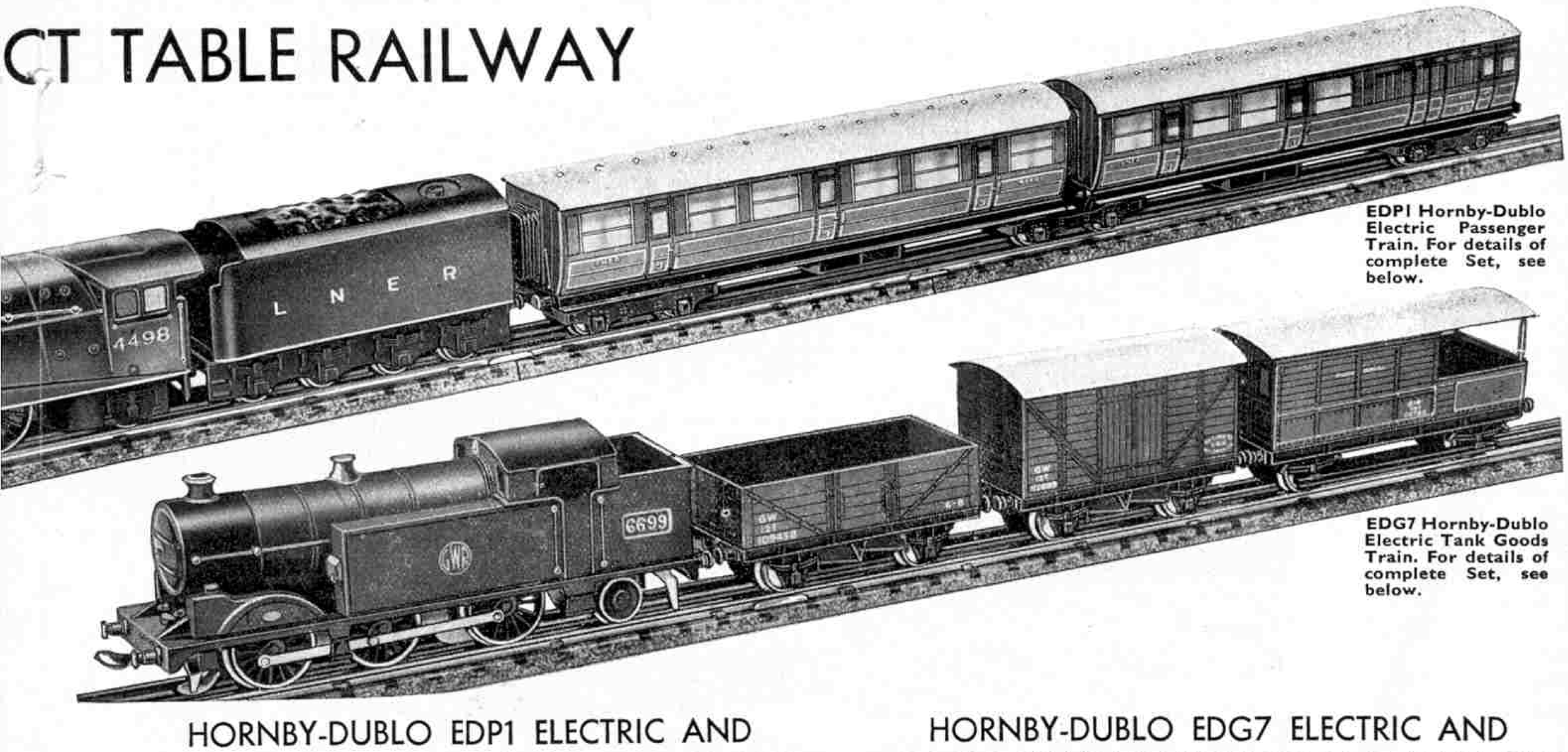


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EDP1 Hornby-Dublo Electric Passenger Train. For details of complete Set, see below.

EDG7 Hornby-Dublo Electric Tank Goods Train. For details of complete Set, see below.

HORNBY-DUBLO EDP1 ELECTRIC AND DP1 CLOCKWORK PASSENGER TRAIN SETS

ELECTRIC

EDP1 Hornby-Dublo Electric Passenger Train Set, L.N.E.R. Contains EDL1 Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Automatic Reversing), Tender D1, Two-Coach Articulated Unit D2, Dublo Controller No. 1, seven EDA Curved Rails, one EDAT Curved Terminal Rail and two EDB Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **70/-**

Dublo Transformers are specially designed for these Trains; no others should be used.

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:

EDPA1 Electric Passenger Train Set, L.N.E.R. (With Dublo Controller No. 1a.) Price **61/6**

CLOCKWORK

DP1 Clockwork Passenger Train Set, L.N.E.R. Contains DL1 Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Reversing), Tender D1, Two-Coach Articulated Unit D2, eight DA Curved Rails and two DB Straight Rails. Price **39/6**

HORNBY-DUBLO EDG7 ELECTRIC AND DG7 CLOCKWORK TANK GOODS TRAIN SETS

ELECTRIC

EDG7 Electric Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains EDL7 Six-coupled Tank Locomotive (Automatic Reversing), Open Goods Wagon D1, Goods Van D1, Goods Brake Van D1, Dublo Controller No. 1, seven EDA Curved Rails, one EDAT Curved Terminal Rail and two EDB Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **55/-**

Dublo Transformers are specially designed for these Trains; no others should be used.

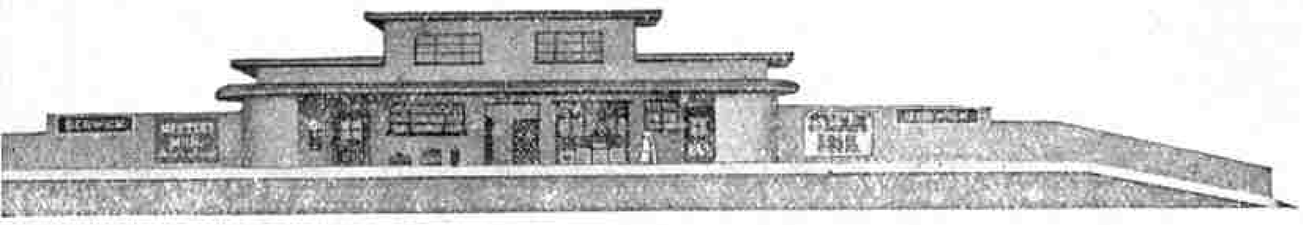
Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:

EDGA7 Electric Tank Goods Train Set. (With Dublo Controller No. 1a.) Price **46/6**

CLOCKWORK

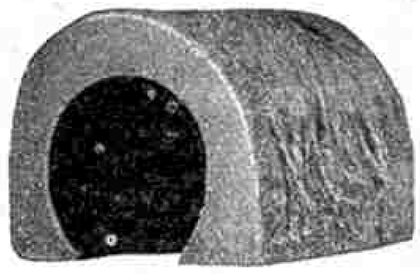
DG7 Clockwork Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains DL7 Six-coupled Tank Locomotive (Reversing), Open Goods Wagon D1, Goods Van D1, Goods Brake Van D1, eight DA Curved Rails, and two DB Straight Rails. Price **27/6**

n of Hornby-Dublo Accessories



MAIN LINE STATION D1

e model in wood of a modern-style station. It is long enough to accommodate a three-coach d with printed gummed slips giving a choice of four names—"Berwick" (L.N.E.R.), "Penrith" (G.W.R.) and "Ashford" (S.R.). Size: Length 24 in., width 4½ in., height 3⅝ in. Price **7/6**



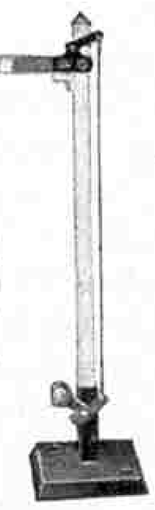
TUNNEL D1 (SHORT)

This Tunnel is 5½ ins. long and is suitable for either curved or straight track. Price **1/3**

Upper-Quadrant Signals

Signal D1 Single Arm "Home" (as illustrated) or "Distant." Price **1/-**

Signal D2 Double Arm "Home" and "Distant." Price **1/4**



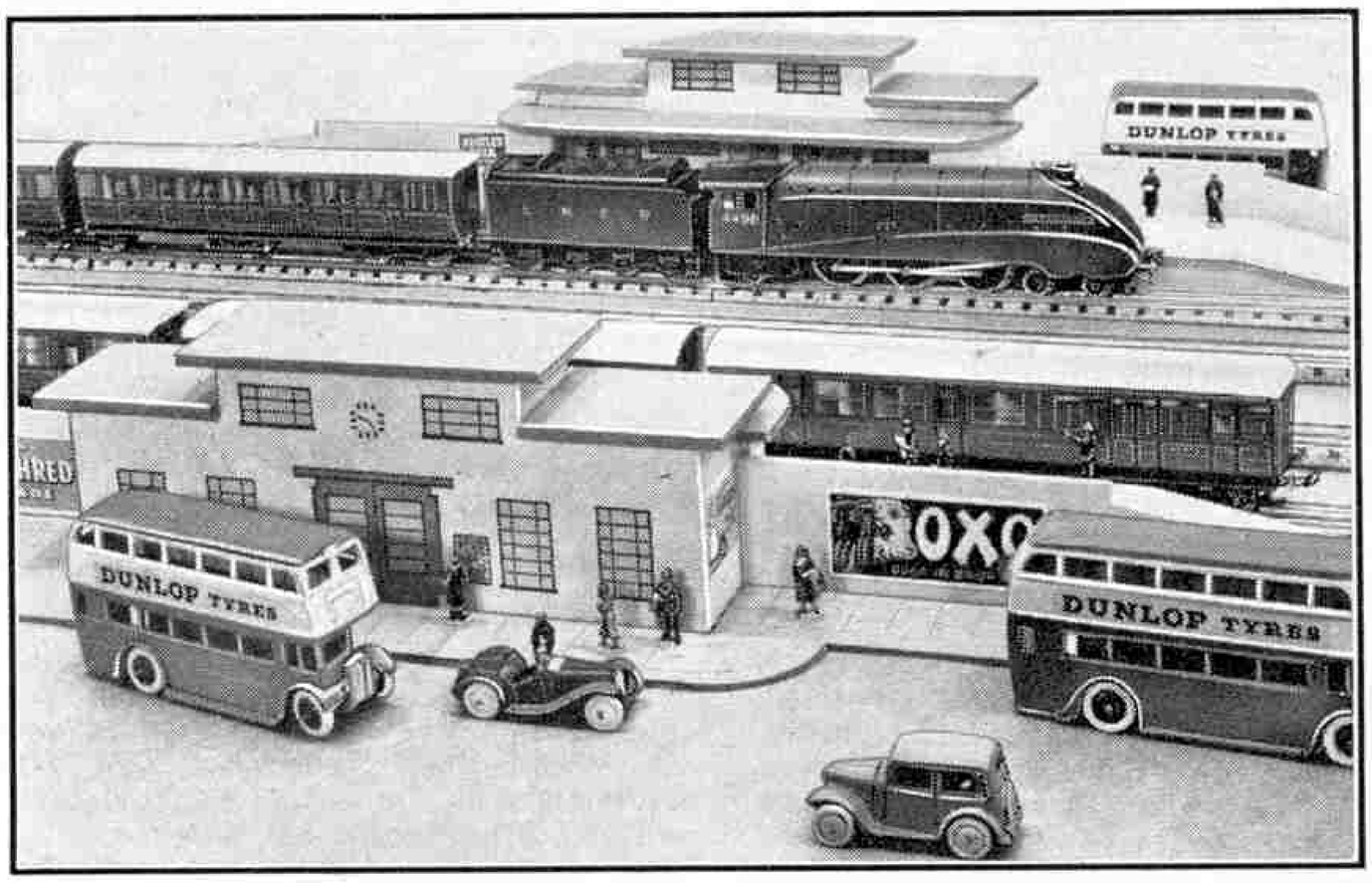
LTD. — BINNS ROAD — LIVERPOOL 13

Additions to Hornby-Dublo Layouts

Fun with Accessories and Dinky Toys

IN previous issues we have referred to the running of Hornby-Dublo Trains, and attention also has been given to accessories such as Stations and to the layout possibilities of Hornby-Dublo Track. It is not enough to run our trains to and fro over the line, however, or even to provide such loads as may appeal to us in the open wagons of our goods trains. A railway on which this is done may still lack life, but fortunately we can provide it by using the standard Series of Hornby-Dublo miniature figures. These are perfectly modelled and are coloured in the most realistic manner and, as the figures in the illustrations on this and the following page show, the different attitudes in which they have been depicted are very true to life. These photographs also will suggest likely uses for these excellent figures to keen Hornby-Dublo railway operators.

Actually there are two Sets of these miniatures, each of which contains six figures. One Set consists of miniature railwaymen, and the other is made up of passengers. It is interesting to note that, although the bases necessary to support these tiny folk are extremely neat, they are sufficiently substantial to prevent the figures from being knocked over easily. This is a very good feature, for nothing is more annoying than to complete the setting out of a realistic scene, and then to have half of the figures in it collapsing because of an accidental knock!



Various Dinky Toys components can be used effectively on a Hornby-Dublo Railway System. In this illustration the Pavement Set, Double Decker Buses and Small Cars add to the realism of the scene.

Most important of the figures contained in the Set of miniature Railway Staff D1 is the Stationmaster, who has a smart appearance in his service cap and long coat. He is holding some papers in his hand, which can be taken to be the usual working timetables or possibly some special instructions, according to circumstances. His usual position will be on the station platform, where he can observe the arrival and departure of trains and attend generally to the working of the station. It is also quite fitting to use him to supervise operations at the goods depot.

Most workmanlike is the Porter, who is wearing the usual sleeved waistcoat of his grade. He is evidently fond of his work, for he is modelled walking briskly along carrying a bag in each hand! None of the passengers will be able to complain of the slackness of porters at any station on a Hornby-Dublo railway.

The Ticket Collector is more life like than the usual models of this kind. He has his left hand outstretched, as if in the act of taking a ticket and the obvious position for him is on the platform by the exit from the station. His outstretched hand makes him suitable for placing in other positions, however, and owners of Hornby-Dublo layouts who exercise a little imagination will be able to find plenty of jobs for him to do.

The Guard is neatly uniformed and is in the act of giving the "*Right away*" by means of the green flag, which he is waving. He gives a most realistic aspect to the platform at the moment of departure of a train. He cannot of course travel by the train, nor is it really correct to leave him on the platform after the train has gone. This creates a difficulty that most model railwaymen will have come up against. Some solve the problem by removing the Guard from the platform and holding him in the hand, or at least putting him somewhere out of sight until the next train arrives. This is easy enough to do on a simple layout with only one station but may be awkward for a single-handed operator on a large system.

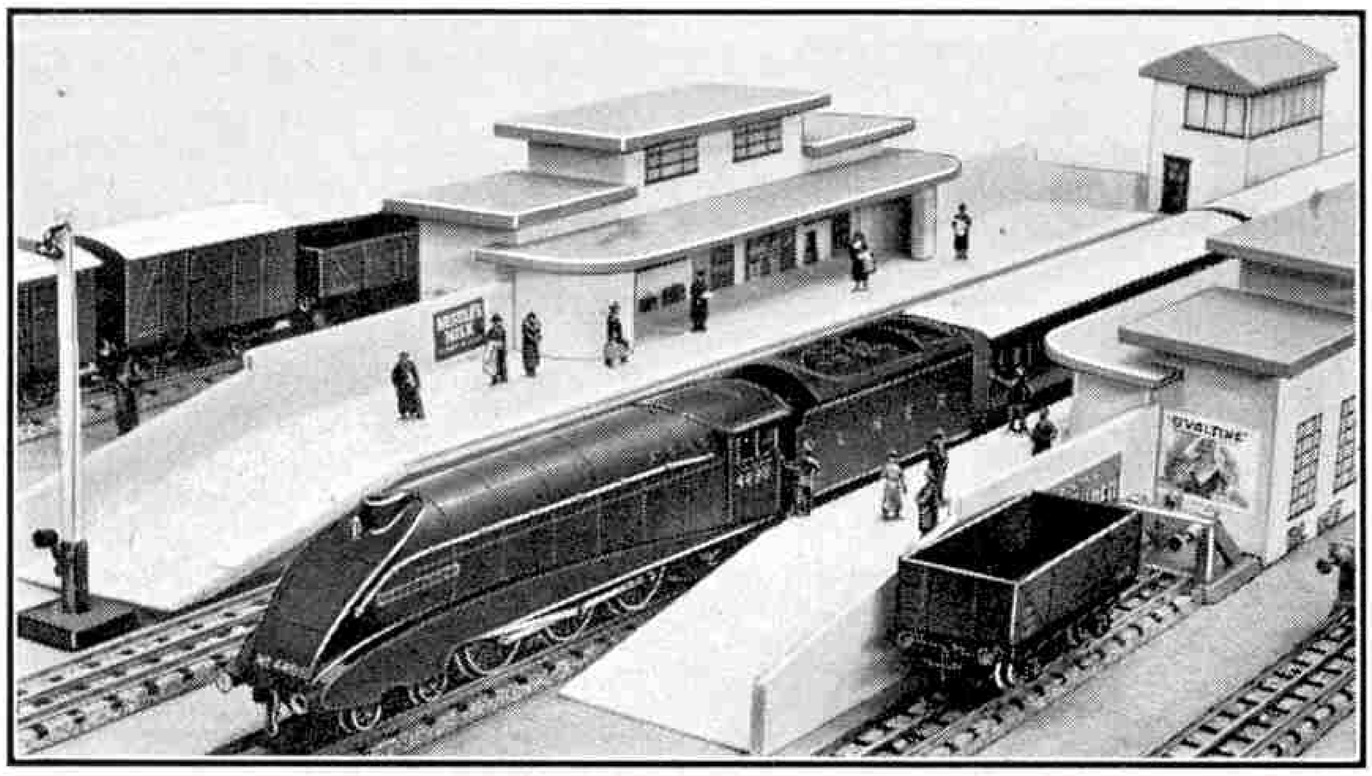
The Shunter is an unusual figure who will be perfectly at home in the goods yard. He is standing with his shunting pole held in one hand, and with the other hand and arm outstretched as if signalling to the driver. He is wearing a long service mackintosh with the collar turned up, and is evidently ready to carry out his rather rough duties under the worst weather conditions.

Finally there is the Locomotive Driver, a typical figure in overall coat and trousers, the coat being modelled as if buttoned at the top only, in the manner affected by most enginemen. He can stand on the platform as if waiting for the Guard's signal, or can be placed alongside his engine during a stop as if he is just looking round it like the real enginemen often do. Again he can be used in the engine sidings and here his duties can be varied, according to requirements.

Having staffed our railway and provided the trains, we have now to consider our passengers. The Set of miniature Passengers D2 consists of six figures, three of whom are men and three women. It is scarcely necessary to go into details concerning them as they are typical of the people to be found every day on station platforms.

Our railway must look after the safety of its passenger and freight traffic and a system of signals therefore is

necessary. In this respect the Hornby-Dublo railway owner is well provided for. Hornby-Dublo Signals are perfect reproductions in miniature of the modern upper-quadrant signals. They have a remarkably effective appearance for they are in strict proportion to the other components. Their tapering posts have none of the heavy appearance that characterises many miniature signals. Their finish is accurate, and they work perfectly.



An appearance of "life" is given to the station platforms by the use of Hornby-Dublo Railway Staff and Passengers. Some of these figures can be used for several purposes, as indicated in this article.

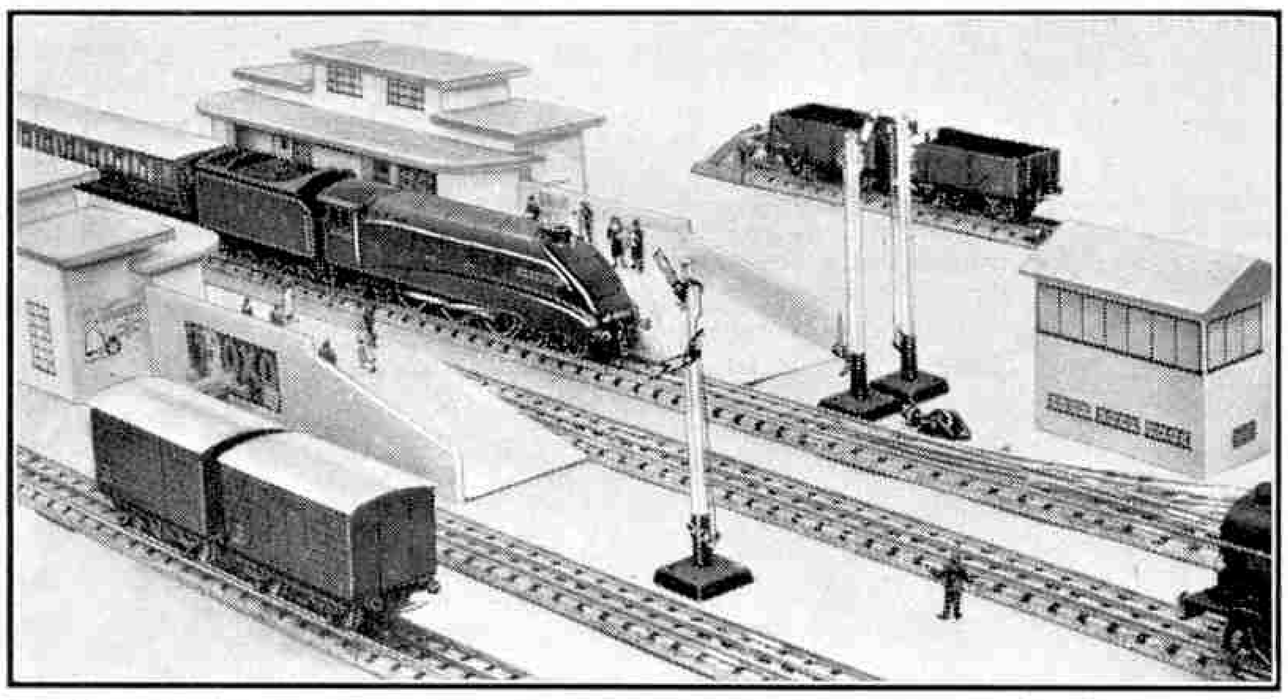
Three distinct patterns of Hornby-Dublo Signals are made and these are sufficient for the correct signalling of almost any layout. There are two Single Arm Signals, one having what is known as a home semaphore and the other being provided with the familiar distant semaphore with its notched or "fishtail" end. The home signal is always a definite stop signal and when in the danger position it must on no account be passed by a train. The distant signal however is placed a certain distance in front of the home signal and acts as a warning indication. If it shows "line clear" the corresponding home signal will show "line clear" also. If the distant semaphore is in the danger position however it warns the driver that he must expect to find the home semaphore at danger also. It thus gives him time to slow down his train and be prepared to stop if necessary. Sometimes of course the home semaphore will show "line clear" by the time the train reaches it, although the distant may have been at danger.

The correct use of these Signals on a miniature railway system is important. As a general rule it may be taken that all main line points require to be protected and it is necessary also to place signals so that trains are given permission to enter and leave the stations. For these purposes the Hornby-Dublo Single Arm Signal with a home semaphore must be used. It would be quite incorrect to place a distant signal with the idea of its controlling a set of points. The distant should be placed at least a train length in front of the home signal to which it applies. On a Hornby-Dublo layout therefore a train approaching a station section will first pass a distant signal, then the corresponding home signal, the latter giving the admission to the station. Departure from the station is governed by a signal with a home semaphore, which is known as a starting signal.

Then there is the interesting Double Arm Signal, which has a home and distant semaphore mounted on the one post, the home semaphore being above the distant. This is used where there is insufficient distance between two home signals to allow of the employment of a distant signal. The distant semaphore is therefore attached to the same post as the first home semaphore.

Owing to the restricted distances on miniature railway systems, the Double Arm Signal is most useful. It can be employed quite well at the approach to a station in order to indicate to through trains whether the road is clear past the station. If the road is clear throughout, both the home and the distant semaphores will show "line clear," but if the signal at the head of the platform is at danger and a stop is to be made, the home semaphore of the Double Arm Signal only will show "line clear," the distant remaining in the caution position. The distant should never show "line clear" while the home arm on the same post is at danger. In actual practice this is prevented by means of an ingenious mechanism.

Once the railway system has commenced operations on a realistic basis, the Hornby-Dublo owner invariably turns his attention to provide some evidence of road activities at or near his station. It is possible to do a great deal in this direction with the aid of Meccano Dinky Toys, and some really good fun is to be had in the working of road traffic in conjunction with the railway operations.



Hornby-Dublo Signals are prominent in this illustration. In the foreground the Double Arm Signal indicates that the line is clear into the station only.

One of the most successful Dinky Toys for use in conjunction with a Hornby-Dublo Railway is the Double Decker Bus No. 29c. Several of these realistic vehicles will allow a good service to be provided and a regular "bus stop" can be instituted outside the Main Line Station. Here, incidentally, the Pavement Sections Dinky Toys No. 46 are most useful. Even a single Bus can be used quite effectively. Where the Buses are supposed to be operated by a single company it is desirable that they should all be finished in the same colour.

Of the private motor vehicles the Small Cars, Dinky Toys No. 35, give a very good effect when used on a Hornby-Dublo system. The photograph on the previous page includes both an open and a closed car of this type. Heavy motor transport can be represented by various commercial motor vehicles, such as the Wagon Dinky Toys No. 25a, and the corresponding Trailer, Dinky Toys No. 25g, which can be coupled to it.

How We Run Our Hornby-Dublo Railway

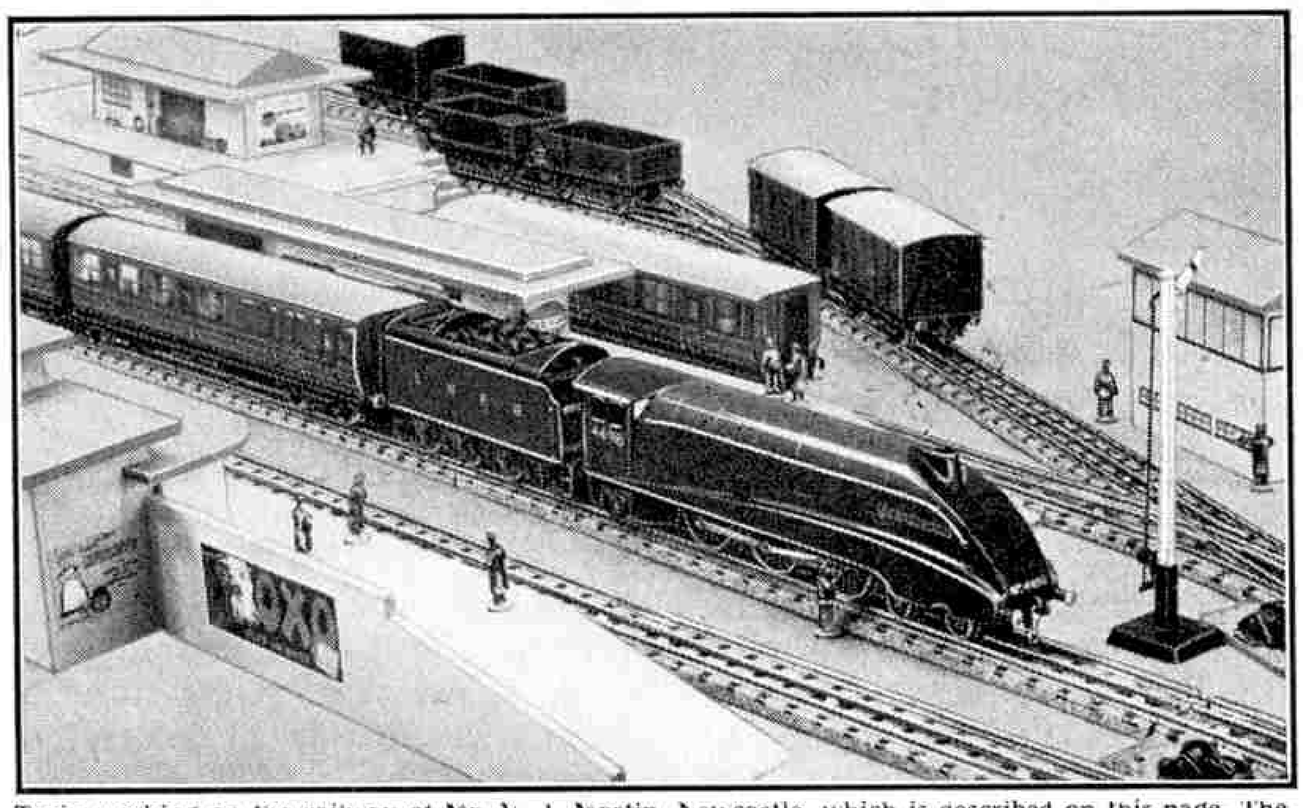
A Fascinating Electric Layout

By V. J. Martin

WHEN the Hornby-Dublo Miniature Railway System was announced, we studied its details carefully, as we did those of other makes, and it was unanimously decided to adopt Hornby-Dublo equipment for the electric line we had in mind because of the ease of control it affords, the power and smooth running of the electric engines, and the realistic finish of every part. We acquired a Hornby-Dublo Passenger Set and Goods Set, together with a few extra Wagons, Vans and Corridor Coaches.

Then we planned a provisional layout and worked out on paper the proportions of various standard formations, such as a "run-round" loop for use in the station, the clearance between tracks for an Island Platform, and the space required for a crossover. This is worth doing beforehand, as buying several complete sets generally leaves you with more curves than are necessary and too few straight sections.

We noted, among other things, that the Hornby-Dublo Points exactly correspond to a Curved Half Rail and a Straight Half Rail. Out of this arises the ease with which a crossover can be fitted in almost anywhere in the track. One simply connects either two left-hand Points or two right-hand Points, adds two Straight Half Rails, and there it is. We noted too that every set of Points requires one Curved Half Rail to bring the curved branch line parallel to the main line, and various other track requirements for different purposes. Armed with this information we purchased as much track as we could afford and began to develop our layout.



Train working on the railway of Mr. V. J. Martin, Newcastle, which is described on this page. The express train, with the streamlined locomotive "Sir Nigel Gresley" at its head, is standing alongside the island platform forming part of the main station.

It will be seen from the diagram on this page that there is a continuous main line, which is doubled in the principal station. This provides a run-round loop as well as making the station look more realistic. There is also a goods yard, and a branch line terminus with its own run-round loop. Each portion could of course be elaborated as desired. The gaps in the track in the diagram indicate the insulating gaps in the electric circuit, and considerable thought has been given to the placing of these with a view to convenience of running and control. These breaks are easily made by slipping a piece of paper between the flat centre rail contacts when joining up the rails; the rail is not altered in any way.

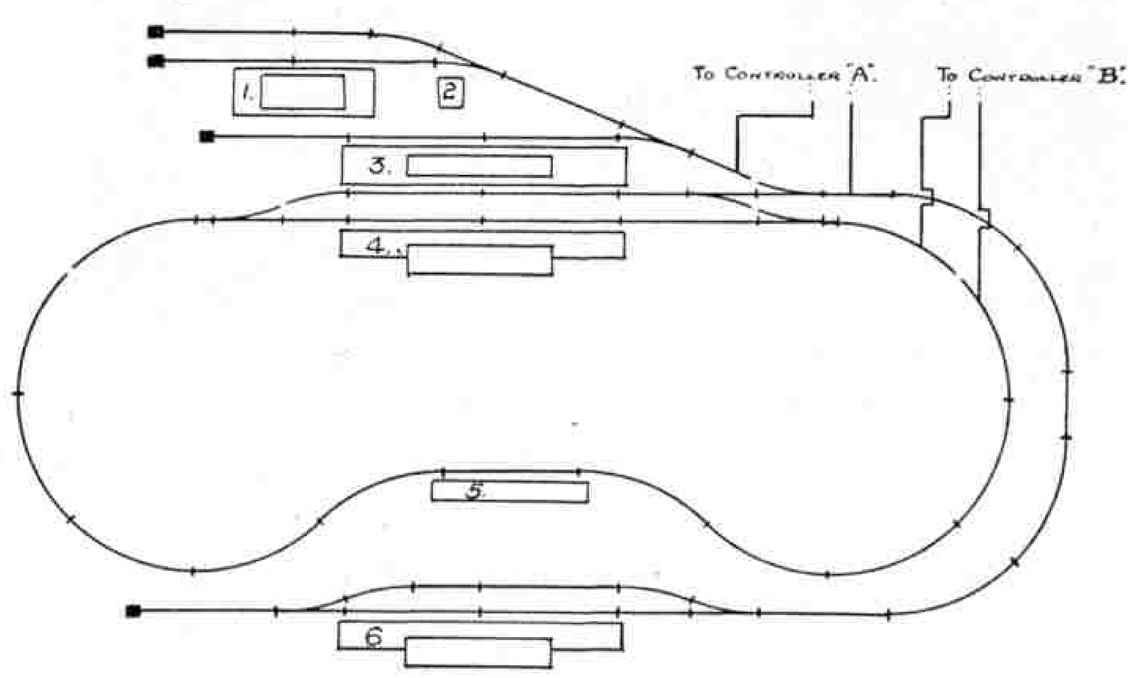


Diagram of the layout, showing the insulating gaps. The numbers refer to various buildings and accessories as follows: 1. Goods depot; 2. Water tank; 3. Island platform; 4. Main platform; 5. Wayside halt; 6. Branch line station.

The control panel carries two Dublo Transformers No. 1, and two Controllers. Each Controller is connected to two miniature tumbler switches, so that two sections of the main line, the branch line, and the goods yard can each be controlled individually. The only thing we have to remember is not to allow two engines together on one section, but this is closely parallel to the block system in real practice. In any case the load of two engines will cause the circuit breaker on the Controller to trip, so that we shall never have end-on collisions.

A simple working programme can be evolved on the following lines. We generally start with the Two-Coach Articulated Unit alongside the Island Platform and the A4 "Pacific" engine "*Sir Nigel Gresley*" with "steam up" next to the main platform; this is because we have as yet no engine sheds. The ordinary Corridor Coaches are at the branch station, the Vans and Wagons are in the goods yard and the tank engine is by the water tank.

The "Pacific," which is heading to the left in the diagram, is moved forward and then backed on to the Articulated Unit standing at the Island Platform. As long as the 0–6–2 tank engine is beyond the goods yard points, where the insulating gap is marked with a Signal, and the yard circuit is switched off, the express engine can be worked over any part of the branch line circuit as required by means of the second Controller. The express pulls out for the run from say "Edinburgh" to "Newcastle," and the points are set for a continuous run in a counter clockwise direction round the main line section.

The goods yard is now switched in and the tank engine runs round to "Hexham." It brings the Corridor Coaches back to the main station as a local suburban train, stopping at the Island Platform. One of these Coaches is a through carriage and will have to be attached to the express, which during this time has been running round the main line on its journey from "Edinburgh." Now our tank engine is at the wrong end of the train, and we must use the main line to run round. A "request stop" is made of the express at the wayside halt, such as happens at Drem Junction for North Berwick on the L.N.E.R.

While the train is stationary the "country" section of the main line is switched out, and then we can use the station section for our tank engine, provided we never run beyond the breaks in the circuit just outside the station. This also is marked with a Signal as explained before. One Corridor Coach is pulled away and shunted into the other side of the Island Platform for use later, and the engine is brought behind the remaining through carriage.

Now the express is off again, next stop "Newcastle," where the through carriage has to be picked up. It pulls in on the main platform side of the station. Having disembarked passengers who wish to catch the local out of "Hexham," it draws forward till the engine is beyond the signal post, and therefore beyond the station circuit; in other words it is in contact with the country section of the main line, which is at once switched off. While the passengers bustle over the footbridge to reach the carriage on the far side of the platform, the tank engine draws the through coach out of the station and then gently propels it on to the rear of the express. It then moves away through the station and reverses on to the coach standing behind the island platform. The express races off to the south and the tank runs out to the branch with its passenger vehicle. On its return it can then be engaged in marshalling a goods train in the yard.

After a sufficient length of main line run, the express completes its journey by running into the station.

The World's Largest Electric Light Bulb

A Memorial to Thomas Alva Edison

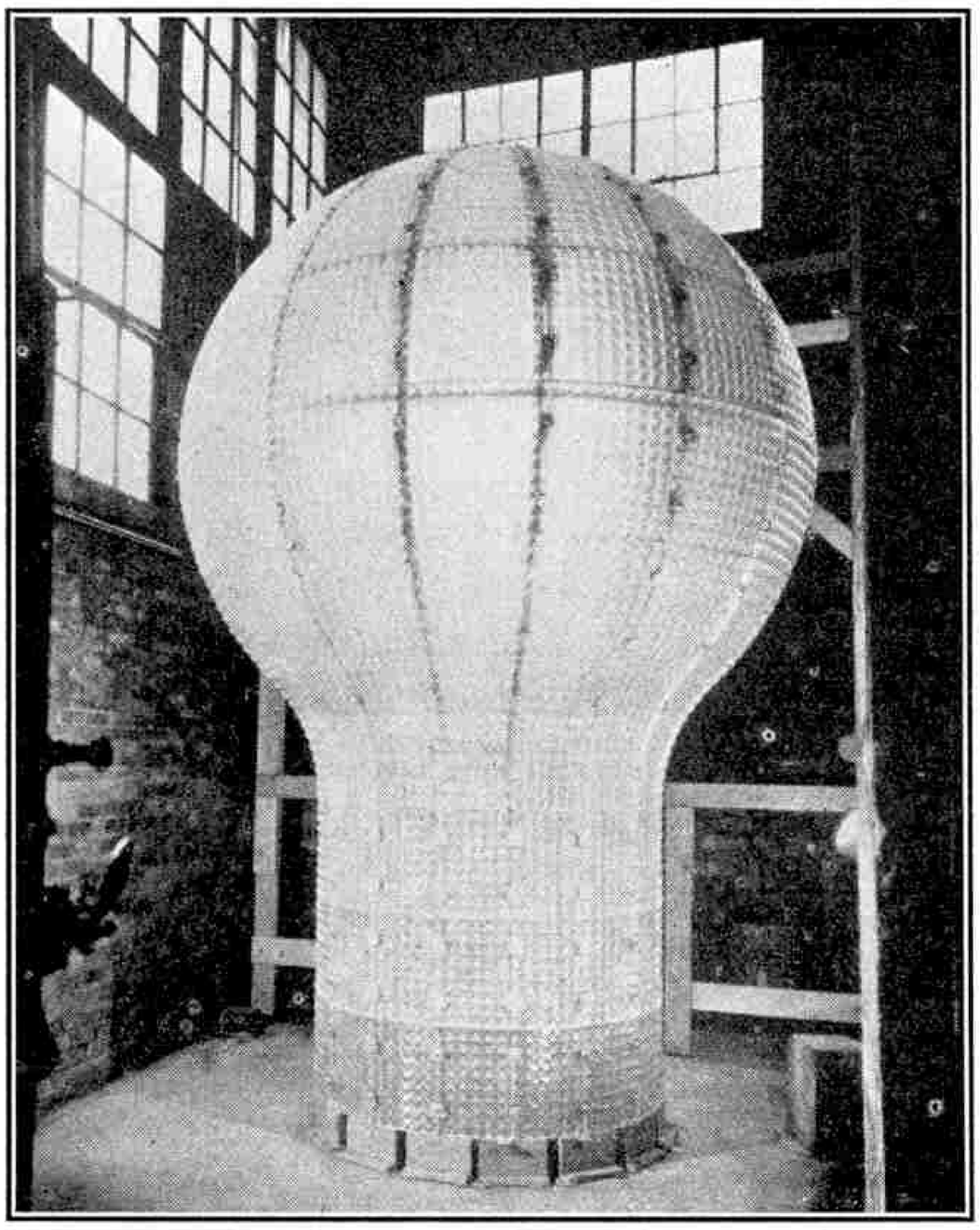
By M. D. Bensusan

AN ancient building rite was recently revived at the Edison Memorial Tower, just completed at Menlo Park, New Jersey. When work was finished at the highest point of the structure, engineers, workmen, and veteran employees of the late Thomas A. Edison met to observe the custom of tree-raising, brought to America by builders from the Old World, and harking back to the time of tree-worship. A fir tree, symbolising strength, was raised to the top of the 131 ft. tower, and thus, according to ancient belief, the patronage of the tree-spirits was invoked.

The fir tree was mounted on the steel framework erected to support the world's largest electric light bulb, which will serve as an aeroplane beacon. On both sides of the Atlantic difference of opinion exists as to the credit for the invention of the incandescent bulb, Joseph Swan having exhibited one in England during the year previous to the appearance of Edison's product. But, in any case, in America a bulb will always seem a natural part of any memorial to Edison, whose genius for promoting the invention not only gave that nation her first practical electric lighting system, but benefited her industrially. A striking example of the latter is afforded by the makers of the giant bulb, the Corning Glass Works, a well-known industry headed by a former U.S. Ambassador to England, Alanson B. Houghton. In 1879 it was a comparatively small glass factory, noted for research. Edison called upon it, in that year, to furnish "a thin bubble of glass" to surround the filament of an electric lamp. From the successful experiment grew the great bulb producing department of the Corning Glass Works.

Later research at Corning provided other milestones in the history of glass-making, notably "Pyrex," the temperature-resisting glass, and the famous 200 in. telescope disc. The year 1937 found the experts working on the problem of the commemoration bulb, the first circular cast job in the glass industry. After eight months the bulb, 13 ft. 8 in. high moulded in 153 curved sections, 2 in. thick, from over 6,000 lb. of amber-tinted "Pyrex," was ready.

The £20,000 memorial tower is the gift of one man, William Slocum Barstow, President of the Thomas A. Edison Foundation, on behalf of the Edison Pioneers, an organisation of former Edison employees, whose names, present and deceased, are recorded in the tower. The structure and all its symbolism has a much wider significance than is generally understood abroad, being a monument to the total achievement, not only of Edison's talents for invention and commercialisation, but of all who worked with him in his laboratories and in the various industries he created. The site of the tower is considered to be that of the work-bench where Edison experimented over fifty years ago.



The world's largest electric light bulb, assembled on its steel frame. It is now at the top of the Edison Tower, Menlo Park, New Jersey, in the United States. It serves as an air beacon as well as a memorial to Edison, the famous inventor.

Since 1929, in a temporary tower there, a light has been burning, switched on by Edison himself from Dearborn, Michigan. During the erection of the permanent tower there has been no interruption of this light, which is fed by several sources of current as a safeguard against the failure of any one of them. It is now mounted on a pedestal in the base of the tower. This light is entirely independent of the bulb at the summit, the prismatic interior of which is illuminated with 12 bulbs, totalling 5,200 watts, and 12 duplicate bulbs that will cut in automatically when those in use burn out. Powerful floodlights play on the shaft from below.

Durability has been sought in every feature of the design, from the exposed bulb made of "Pyrex" to withstand all weather conditions, to the back-fill of earth between the floor of the base and the foundation pad of reinforced concrete 2 ft. 6 in. thick. Provision has been made for pressure of a wind velocity of 120 m.p.h.

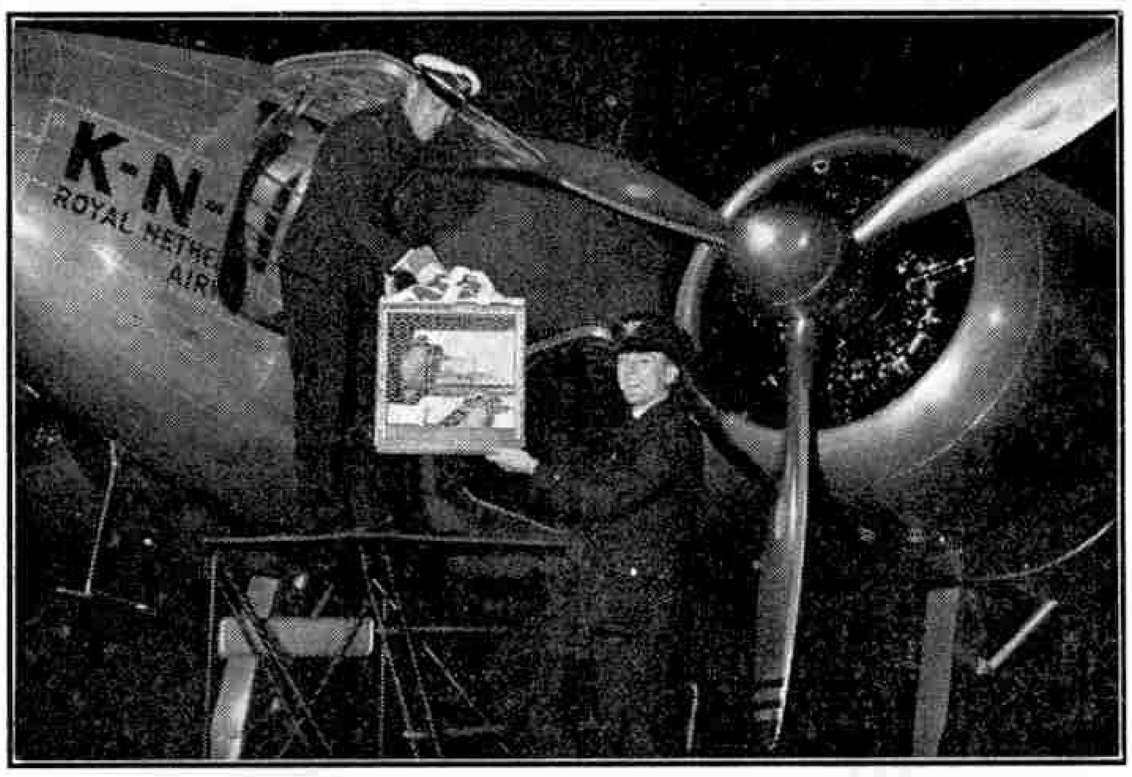
With eight dark pillars at the base, the ribbed shaft graduates in colour to a very pale buff below the amber bulb. From an aggregate of quartz and ceramic, or vitreous material, the exterior forms were precast in slabs 2 in. thick, and steel-anchored to the wooden interior forms. The structural concrete was then poured between, providing a monolithic construction. The high reflecting surface of the aggregates not only produces a brilliant effect, but is washed free of dust with every rainfall. The tower thus represents an interesting achievement in building. The giant bulb at its top started burning on 11th February of last year, the 91st anniversary of the birth of Edison.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Australia's Queerest Aerial Cargoes

Almost anything can be transported by air in Australia nowadays. Two kookaburras were recently sent in a Dutch aeroplane on the 12,000-mile journey from Sydney to Amsterdam for publicity purposes, while crates of lyrebirds have been flown from Victoria to Tasmania. Rams marooned during floods in Queensland have been fed daily from the air, and on one occasion a baby crocodile, three feet long and weighing 13 pounds, was carried from Darwin to Adelaide. A cuscus, a member of the opossum family, and a porcupine were conveyed from Brisbane to Sydney by air, homing pigeons are carried frequently, and canaries are welcome freight for their singing. Day-old chickens, packed in special boxes, are frequently despatched on 9,000-mile flights in Queensland.



Two Australian kookaburras being taken aboard an air liner at Sydney for transport to an Amsterdam zoo. Photograph by courtesy of Milo Photo Service, Sydney.

Spiders were sent by air liner from West Australia to the Prague Museum, while a crate of Malayan beetles that reached Sydney in a Dutch machine were bound for Panama. A Sydney man who likes giant crabs for breakfast has several specially flown from Townsville each morning. Strawberries are carried throughout Queensland, and mangoes are sometimes carried to Sydney.

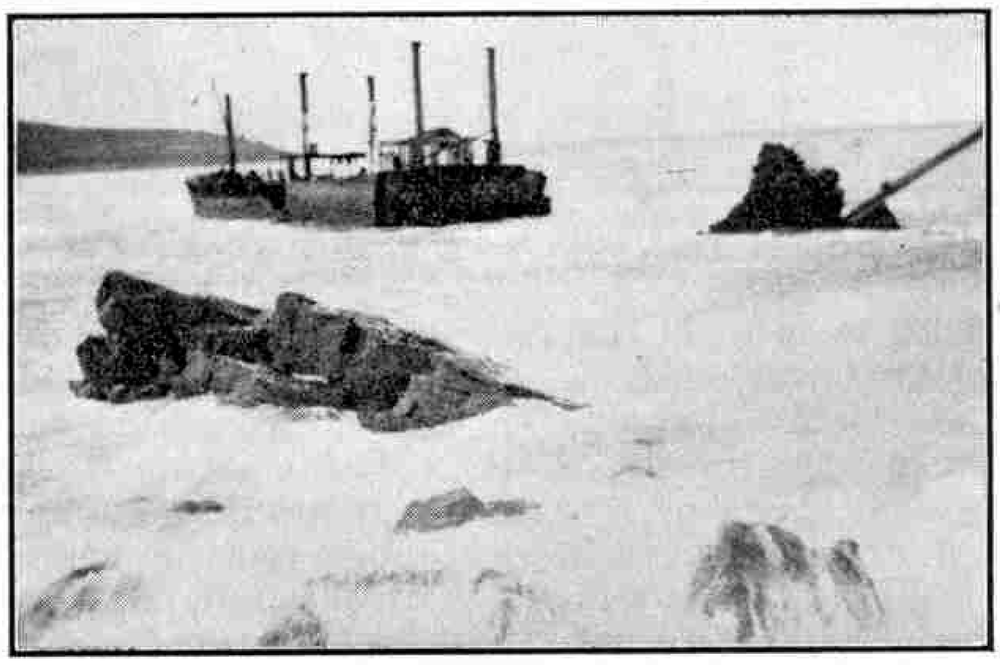
A diving-suit for instant use at the Northern Territory pearling bases was sent from Sydney recently. A frightened greyhound carried on one flight made a suicidal exit through the side of the aeroplane. An orchestral flute player sent his instrument to London by air for adjustment and got it back 28 days later. Another strange consignment consisted of tips for the billiard cues of a champion, which were hurriedly sent to Camooweal recently, while even a set of false teeth found a place in an aerial freight inventory sheet.

K. Allen (Oatley, N.S.W.).

The Wreck of the S.S. "*Alba*"

This story of one of many ships that have been wrecked off the rugged north coast of Cornwall opens about 7 o'clock in the evening several months ago, in the quaint old fishing town of St. Ives. The night was wild, and few folks were about; a gale of wind was blowing from the north and the rain came lashing down, while the sea, never passive on this exposed coast, hurled itself mountain-high on the shore.

Suddenly through the roar of waves and the howling of wind came the penetrating hoot, loud and prolonged, of a steamer's siren. Eight times in succession it blew, and immediately the deserted streets were filled with hurrying figures, all making their way towards the Island, a rock-bound promontory to the north of the harbour. There they saw a cargo boat of several thousand tons fast on the rocks. Over on the pier, the life-boat maroons went off and the boat was promptly launched. Soon she was rounding the Island, making for the vessel in distress, which proved to be the "*Alba*." Before long the crew of the wrecked vessel were taken aboard the life-boat, which was in comparatively calm water while on the "*Alba's*" port side, but was broadside on to the waves when she backed away from the "*Alba's*" bow. Before she could turn a great sea caught her, bowled her over, and hurled all but three of her crew and the rescued men into the sea. True to her type, the life-boat righted herself. The coxswain and the members of her crew swam back to her, and then helped 18 of the 23 men of the "*Alba*" aboard again. When the life-boat capsized the engine was cut off automatically, and could not be restarted as the starting handle had been lost overboard. The boat was driven on the rocks, but the men were landed safely.

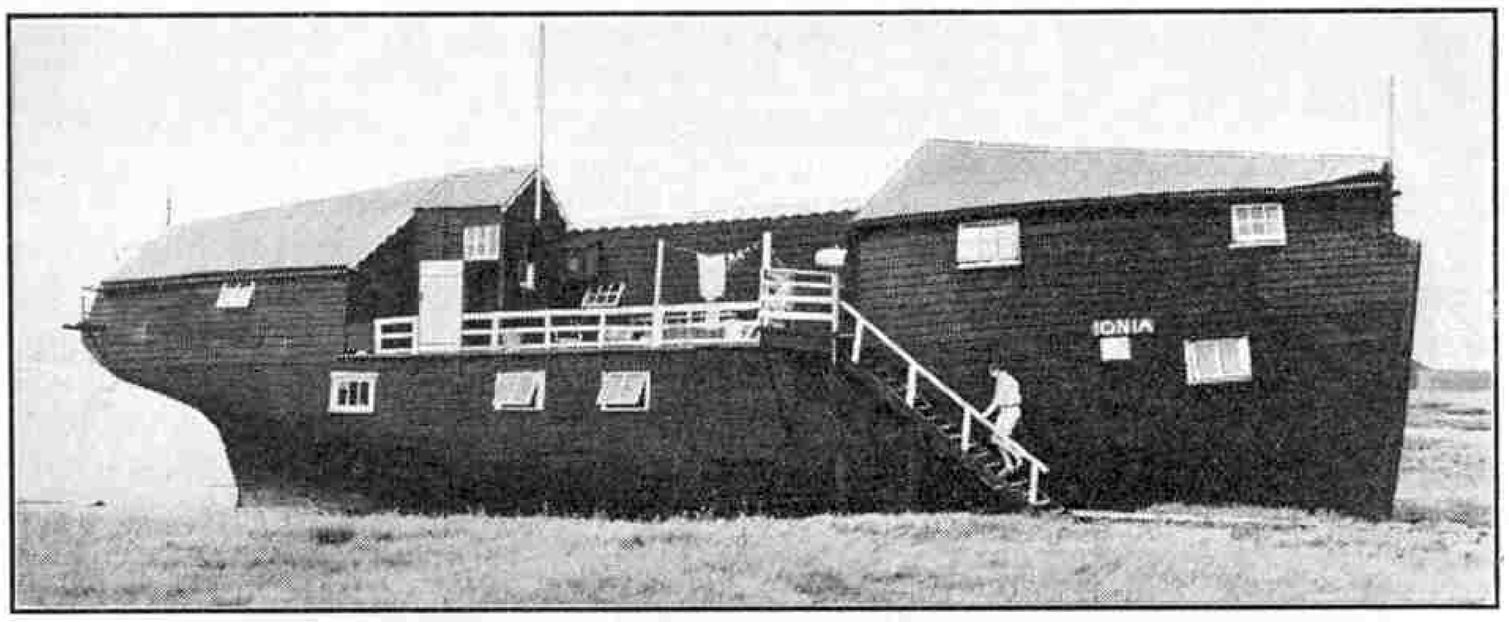


The cargo boat "Alba," wrecked off St. Ives, Cornwall, in a gale, as described on this page. Photograph by G. B. Lush, West Bromwich.

G. B. Lush (West Bromwich).

Dwellings that are Different

A visitor from the Far East once said to me, "England seems all straight lines, with houses in endless repetition." So many of our towns justify this criticism, and the countryside is so rapidly falling into line that several unique dwellings I saw in East Anglia were welcome sights. The picturesque Paston Mill, in beautiful condition externally, figures on many of the views of the Mundesley district, and all visitors surely carry away with them a vivid impression of the mill, with its black tower and white dome and sails. The mill has been made habitable, the machinery being removed about eight years ago. A water tank has been installed in the top room, and below are bedrooms and a living room. The sails still revolve in a strong breeze. What fun to live there!



This unusual "house-boat" is to be seen at Aldeburgh, on the river side. Photograph by C. A. Reader, London.

Another perfect setting for holiday fun is at Aldeburgh, where the huge old boat shown on this page has been fitted out to provide living accommodation. It is perched comfortably on the marshes alongside the River Alde, which nearly enters the sea at that point, but turns southward and flows into the sea 10 miles away, with its name here changed to Ore. From the deck of the "house-boat" there is a splendid view across Aldeburgh Mere, a busy yachting centre.

C. A. READER (London).

New Zealand's Native Bush

I live on the West Coast of New Zealand, where the rainfall is heavy and the climate mild, even in winter. The bush that grows on this coast is unlike that in other parts of New Zealand, and indeed there is no other just like it in the world. Nowhere else are there nickau palms as straight and tall as ours, nor are there anywhere so many of the great tree-ferns that we call pungas.

The bush is beautiful all the year round, but I like it best in spring when the masses of pure white show up everywhere against the dark green. The starry clematis flowers are the most striking, but the olearias are a wonderful sight, too. Of coloured flowers in the spring, none is prettier than the golden kowhai, which drops showers of yellow petals, but it hardly belongs to the bush, as it prefers more open country, especially on the banks of streams and creeks.

Many people prefer the bush in summer, when the ratas and pohutukawas are its most attractive trees, with their glorious masses of flaming red and orange that brighten all the hillsides along the coast.

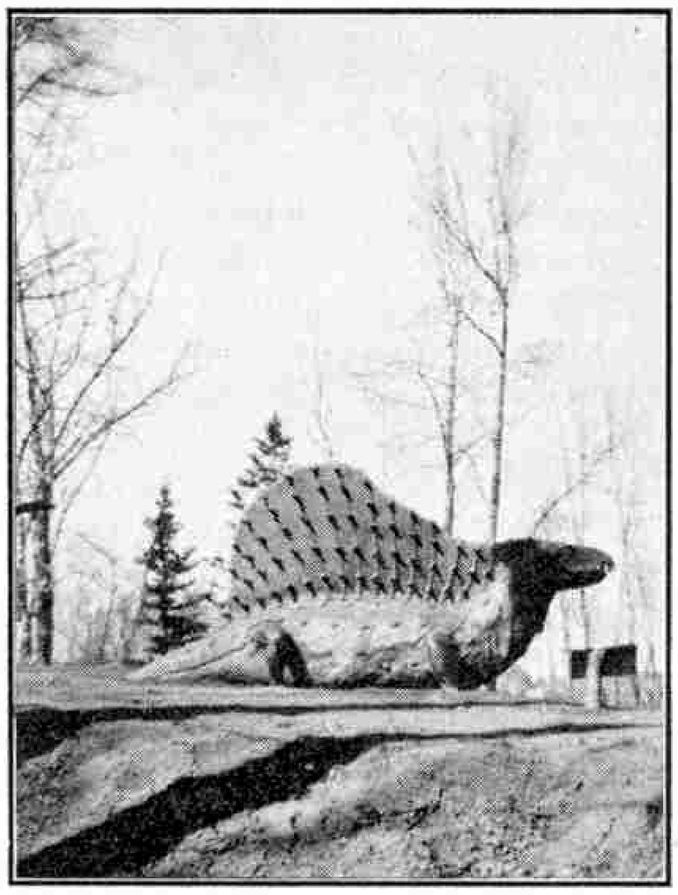
In autumn all the berries are ripening. Red and orange are the favourite colours for our native berries, but in higher altitudes blue, purple, and white berries may be found.

In winter the bush sleeps, and one has an opportunity to admire the many shades of green on the hillsides and contrast them with the white of the snowy mountain caps behind and the blue sea waves rolling in before. At any time of the year one may walk under the trees to find the filmy ferns or delicate mosses and lichens that flourish in moist, shaded nooks; but in a lifetime one could not discover all the treasures of nature that are to be found in the West Coast native bush.

P. M. SHIRTLIFF (Nelson, N.Z.).

A Natural History Park in Canada

There is a natural history park at the east end of Calgary, on St. George's Island, in which is a splendid zoo containing specimens of nearly every animal found in Canada. Perhaps the most interesting section of the park, however, is that allotted to representations of prehistoric animals. These animals, the remains of which have been found from time to time in the Red Deer Valley, Alberta, roamed the plains millions of years ago, and their remains have been reconstructed to give an idea of the actual appearance in life.


A lifelike concrete model of a reptile of 200,000,000 years ago in a natural history park in Canada. Photograph by G. H. Adlam, Calgary, Alberta.

The reconstructions are in concrete and have been erected in odd places in the park to thrill visitors. The largest and probably the most striking shows what the brontosaurus looked like. This is about 17 ft. high and nearly 70 ft. long. Children found great enjoyment in playing on its long smooth tail until the authorities erected a barbed-wire spine along the crest of this tempting slide!

The chasmosaurus, a much smaller animal that also is represented, had a great horny head, and its body was protected, not by scales, as were those of most of these animals, but by a large, bony shield covering its entire whole body. This animal was only about 14 ft. long, and resembled the present day rhinoceros in many respects.

An interesting series of four figures shows the development of the horse, the figures ranging in size from that of a rabbit to that of a mule. Other attractions are the reproductions of two large carnivorous dinasaurs standing in an attitude of battle, their gaping, sharp-toothed jaws and huge bird-like claws giving them a most terrifying appearance, while here and there are the figures of great lizard-like creatures, with those of smaller reptile-like birds perched on trees.

A visit by night to this park is a real thrill, for the animals in the shadow-filled clearings look terrifyingly lifelike.

G. H. ADLAM (Calgary, Alberta).

How To Steer Your Model Motor Cars

Interesting Meccano Mechanisms

By "Lock-Nut"

IF I were asked "Which are the most popular subjects for Meccano models?" I should not hesitate to reply "Motor cars and lorries." Thousands of models of this kind are built every year, and there are very few boys indeed who have not constructed a model vehicle at some period during their Meccano careers. This widespread interest in these vehicles is partly due to the fact that there are so many different types from which to choose and which can be seen everywhere around us, but I think the main reason for their popularity lies in the fascinating mechanisms a modern car chassis incorporates. Most of these mechanisms can be reproduced quite easily in Meccano, and in building them up the Meccano enthusiast gains an excellent knowledge of the principles on which an actual car is based.

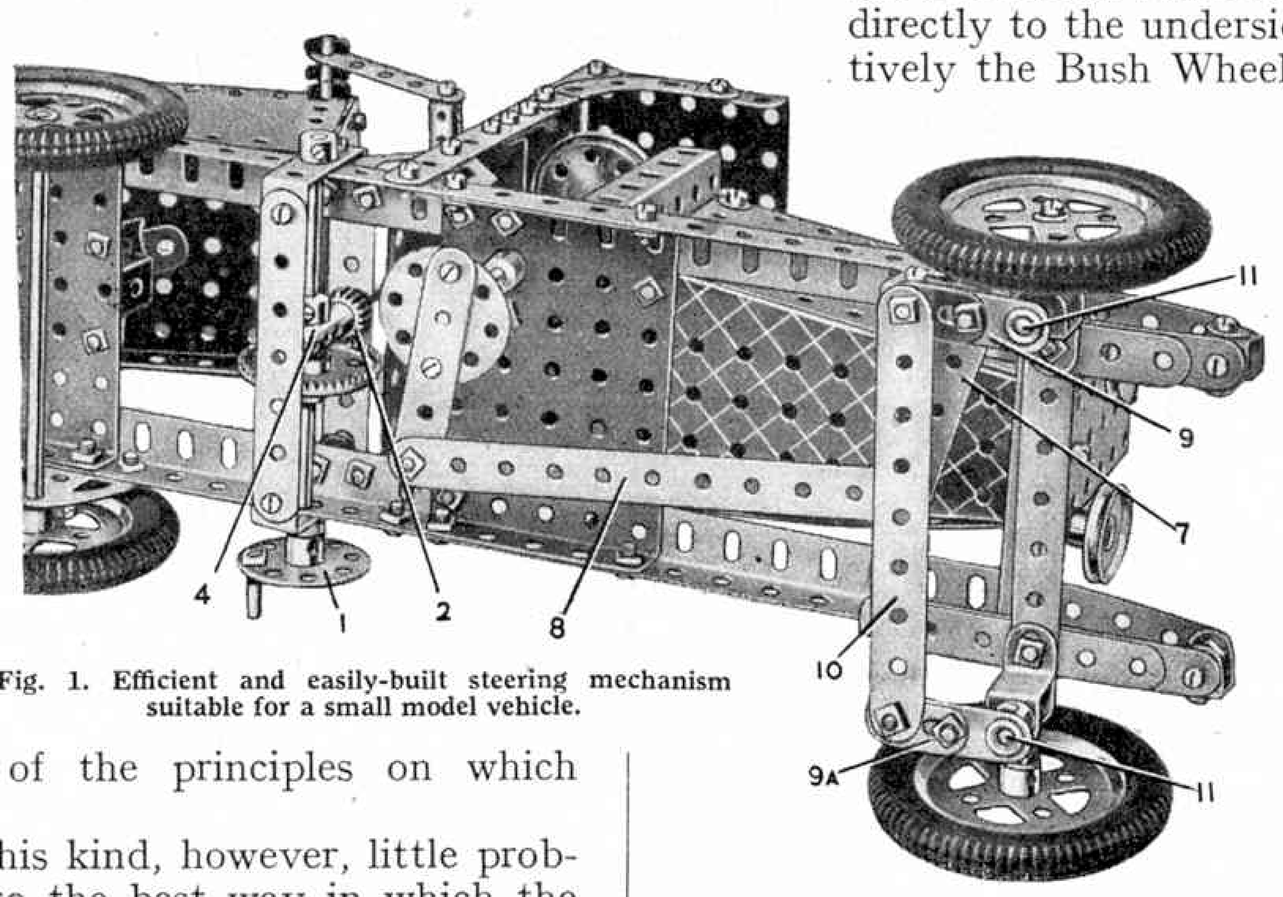


Fig. 1. Efficient and easily-built steering mechanism suitable for a small model vehicle.

In building models of this kind, however, little problems sometimes arise as to the best way in which the various mechanisms can be reproduced with the Meccano parts available. These problems occur most frequently in connection with the steering gear and transmission mechanisms, and in this and a subsequent article therefore I intend to describe various methods of assembling these that are suitable for both small and large models. In the present article I am dealing with the steering gear.

In the simplest type of steering gear a Rod journalled in a Double Angle Strip and fitted at each end with a wheel forms the front axle, and the Double Angle Strip is pivoted at its centre to the underside of the model, usually by means of a lock-nutted bolt. Unfortunately this form of steering is not under control and it is therefore suitable for only the simplest models. A better method, if the parts required are available, is to bolt a Bush Wheel to the centre of the Double Angle Strip used to support the front wheel axle, and to fix a Rod in its boss to form the steering column. The Rod is journalled in bearings formed by the baseplate of the model, and a Reversed Angle Bracket. A Pulley fixed to the upper end of the Rod can be used as the steering wheel.

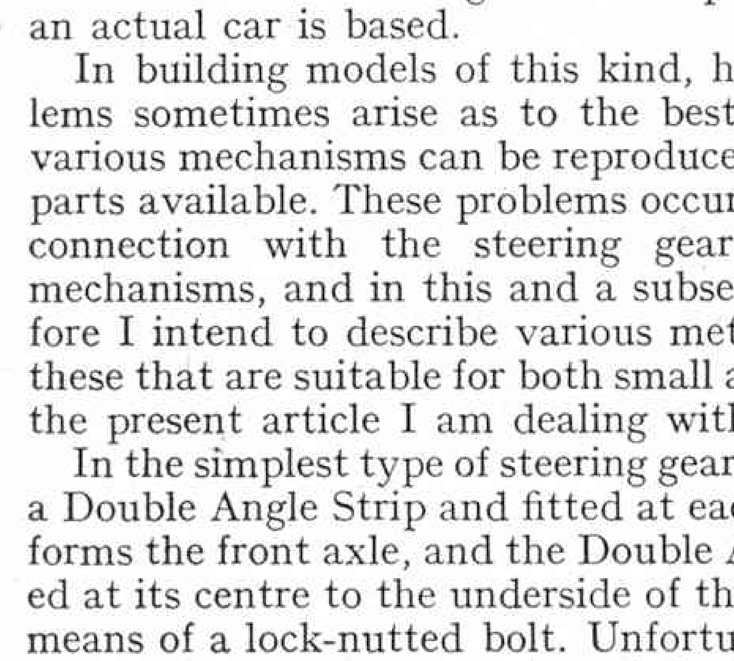


Fig. 2. A simple steering arrangement.

In instances where the model has a long bonnet the arrangement shown in Fig. 2 should be used. A Bush Wheel is fixed to the lower end of the steering column and is connected by Cord to the Double Angle Strip carrying the front axle. The Double Angle Strip is pivoted directly to the underside of the model. Alternatively the Bush Wheel may be dispensed with, the Cord being tied to one end of the Double Angle Strip, wound tightly several times around the steering column, and then tied to the other end of the Double Angle Strip. There is sufficient grip between the Cord and the Rod to enable the model to be steered by turning the steering wheel.

The mechanisms already mentioned are intended only for small models, and are designed so that only a few parts are needed for their construction. Builders of large models will require a steering gear that conforms more closely with the mechanisms used in actual vehicles. On an actual motor vehicle the front axle is sprung to the chassis, and the wheels revolve on stub axles pivoted to its ends. This arrangement is easy to follow in a model. From Fig. 2, it will be seen that a Strip can be bolted across the chassis, in place of the Double Angle Strip, so that its ends project on each side. Two sets of Flat Brackets are then fastened by $\frac{3}{8}$" Bolts to two Double Brackets, so that each forms in effect a $1\frac{1}{2}$" strip with a Double Bracket at the centre. In the lugs of the Double Brackets are journalled $1\frac{1}{2}$" Rods on which the wheels are free to turn, the $1\frac{1}{2}$" Rods being at right angles to the Flat Brackets. These stub axle units are then pivoted by the $\frac{3}{8}$" Bolt to the ends of the Strip bolted to the chassis, further lock-nuts being used to hold them in place.

The front and rear pairs of Flat Brackets are connected together by Cord, the rear Cord being coiled tightly around the lower end of

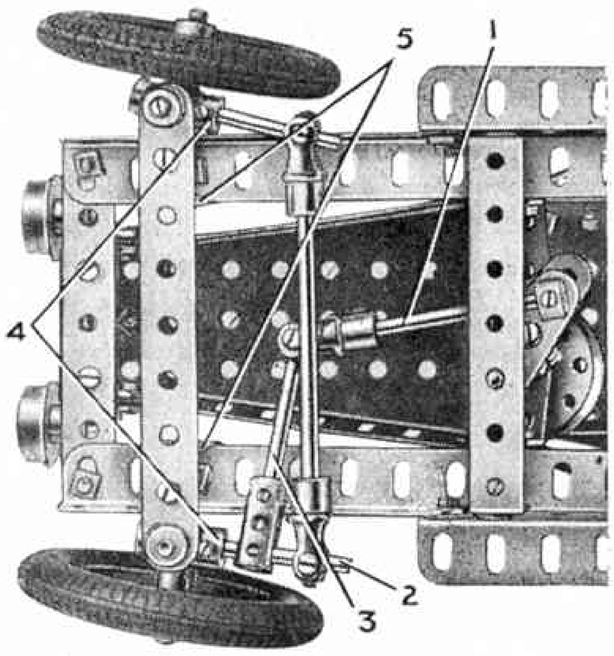


Fig. 3. A robust steering mechanism for heavy models.

the steering column before its ends are tied to the Flat Brackets. This steering mechanism can be fitted to most small models, and works well if it is carefully assembled.

It will be realised that these systems will work satisfactorily only if the steering column is close to the front axle, and although this position is no disadvantage on small models it seriously interferes with the design of larger models. The simplest way of overcoming the trouble is to connect the two rear Flat Brackets in the mechanism previously described with a Strip, the Bolts being lock-nutted. The front Flat Brackets can be omitted. The Strip is fitted with an Angle Bracket at its centre hole, and a small Crank Handle (without Erinoid Grip) is so arranged that its cranked end engages in the slotted hole of the Angle Bracket. A Pulley is fitted to the other end of the Crank Handle and when this is turned the Angle Bracket moves the track rod, which in turn swivels the wheels.

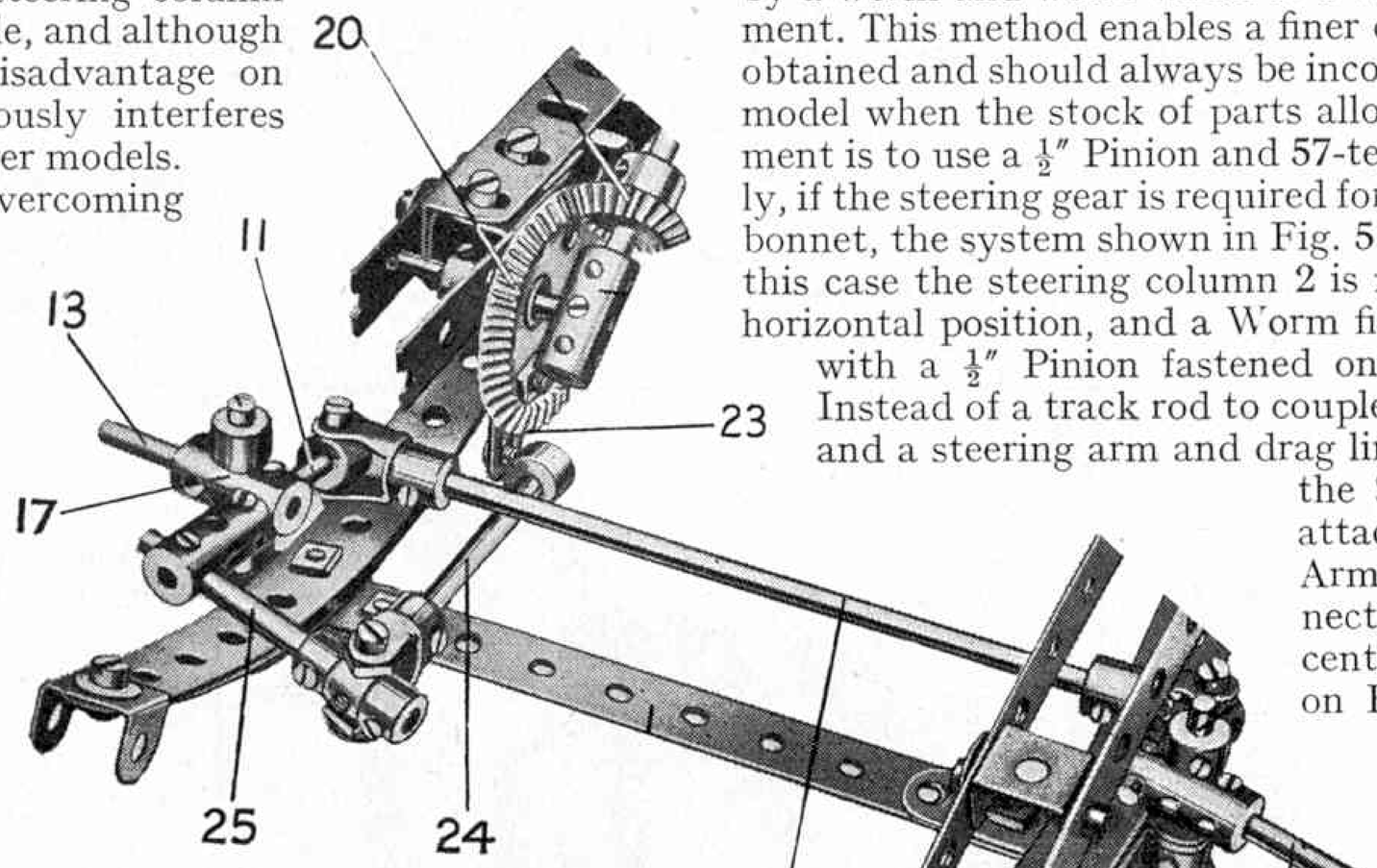


Fig. 4. The Meccano steering gear shown here is based on the Ackermann system used in actual vehicles. The action and special features of this mechanism are described on this page.

For use in large models this mechanism should be modified slightly. The Flat Brackets or, to give them their proper name, the pivot arms, should be lengthened or replaced by $1\frac{1}{2}$" Strips. A Strip of suitable length is then used to connect one of the pivot arms to a Bush Wheel fixed to the lower end of the steering column.

A scheme similar to this is illustrated in Fig. 1. The front axle is a $4\frac{1}{2}$" Strip fitted with Reversed Angle Brackets to provide bearings for the swivel pins 11. These are 1" Rods that carry Collars at their upper ends, and the Cranks 9 and 9a at their lower ends. The wheels are 2" Pulleys and are free to rotate on $\frac{3}{4}$" Bolts screwed into the Collars. The arms of the Cranks are connected together by the Strip 10, which forms the track rod, the bolts being lock-nutted. The steering arm is a $2\frac{1}{2}$" Strip 7, which is bolted at one end to Crank 9, but is pivoted at its other end to the $5\frac{1}{2}$" Strip 8. Strip 8 in turn is pivoted to a $2\frac{1}{2}$" Strip bolted across the Bush Wheel. When the steering wheel is turned its movement is transmitted through Strips 8 and 7 to the Cranks 9 and 9a and thence to the road wheels.

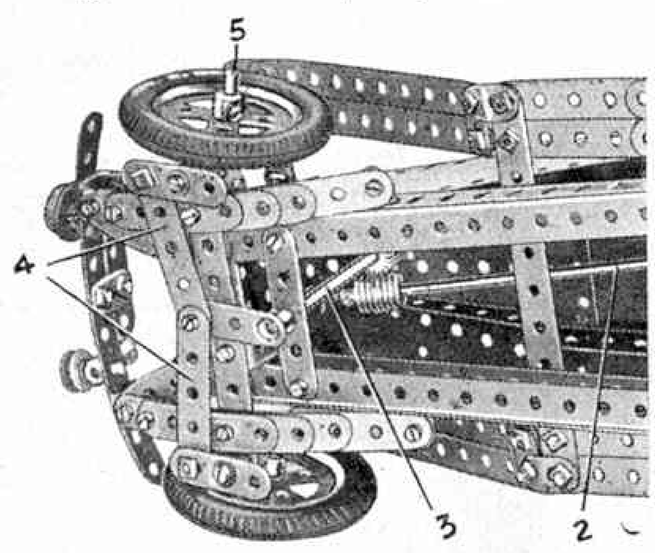


Fig. 5. Originality is a feature of this simple but effective steering mechanism.

The steering arrangement shown in Fig. 3 is similar in principle to that just described, but the constructional details are slightly different.

These steering systems can be simplified somewhat by connecting the pivot arm directly to the drag link, represented by Strip 8 in Fig. 1 and by Rod 1 in Fig. 3.

In actual vehicles, the steering column is not in direct connection with the drag link, but usually is geared to it by a worm and worm wheel or a worm and nut arrangement. This method enables a finer degree of control to be obtained and should always be incorporated in a Meccano model when the stock of parts allows. The best arrangement is to use a $\frac{1}{2}$" Pinion and 57-teeth Gear. Alternatively, if the steering gear is required for a model having a long bonnet, the system shown in Fig. 5 should be adopted. In this case the steering column 2 is mounted in an almost horizontal position, and a Worm fixed to its end meshes with a $\frac{1}{2}$" Pinion fastened on the vertical Rod 2. Instead of a track rod to couple the two front wheels, and a steering arm and drag link as in Figs. 1 and 3, the Strips 4 are pivotally attached to the Double Arm Cranks, and are connected together at the centre to a Crank fixed on Rod 3.

When a motor vehicle turns a corner the near side road wheels describe a sharper curve than the outer wheels. This will more readily be understood when it is remembered that the outer wheels are at a greater distance from the centre of the turning circle. To allow the front wheels to travel through their respective arcs when the car is turning, which is necessary to prevent undue tyre wear and skidding, it is necessary to turn the inner wheel through a greater angle than the outer one, no matter whether the vehicle is turning right or left. This object is achieved by what is known as the Ackermann steering system, and the method by which this can be reproduced in Meccano is shown in Fig. 4.

The gear used in this mechanism comprises two short levers rigidly connected to the stub axles. The levers are joined by the track rod and lie at a slightly obtuse angle to the stub axles, this angle being such that the centre lines of the levers, if extended, would cross at a point on the centre line of the car. Usually the design is arranged so that this point lies just in front of the back axle.

The stub axles 13 and 13a are fixed in Couplings 17 that in turn are pivoted on vertical Rods or swivel pins. It is not possible to fix levers at an obtuse angle to these Couplings, but a similar effect is obtained by fixing the Rods 11 in the positions shown, and joining them by the Rod 12 and Swivel Bearings. It will be seen that the lines joining the centres of the swivel pins and the bolts of the Swivel Bearings would meet on the centre line of the model if they were extended. The actual point at which the lines intersect depends on the length of Rods 11.

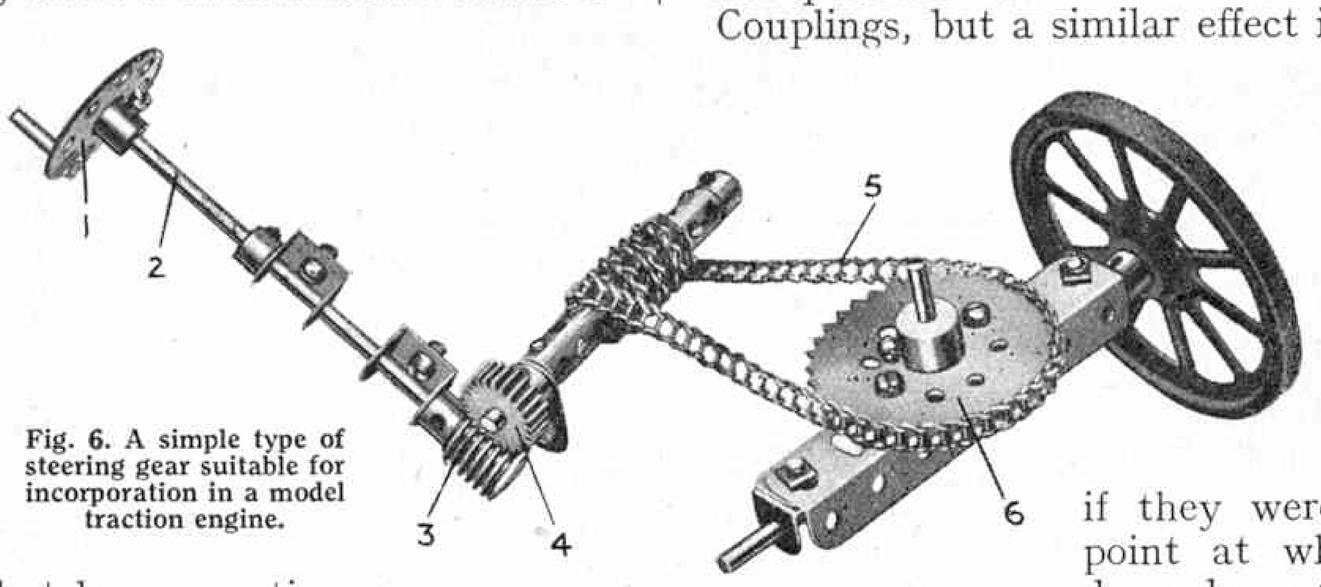


Fig. 6. A simple type of steering gear suitable for incorporation in a model traction engine.

New Meccano Models

A Tower Wagon and Other Subjects for Small Outfits

THE models illustrated this month have been specially chosen because of their simplicity. They are constructed from Outfits Nos. O to 3, and are just the thing for new model-builders. Although easy to build they are very effective, and their subjects are so varied and attractive that they are sure to please every model-builder.

The first model to be described is the realistic liner shown in Fig. 4. Apart from bolts and nuts only 12 Meccano parts are used in this model, and all of them are contained in Outfit No. O.

The hull is the first part to build. Two $5\frac{1}{2}''$ Strips are curved slightly, as shown in the illustration of the model, and secured at the centre by bolting Angle Brackets to each, and turning these round so that the free ends come together and a bolt can be passed through the holes in them. The bolt joining the two Angle Brackets holds also a compound strip, which is formed by placing two $2\frac{1}{2}''$ Strips so that they overlap three holes and bolting them together. This strip forms the deck of the model liner.

The superstructure is next added. Its sides are constructed by fastening two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips together by bolts passed through the holes in their turned up ends. A $2\frac{1}{2}''$ Strip forms the roof and is attached by an Angle Bracket at one end of the structure and inside it. Two $\frac{3}{8}''$ Bolts are fixed on the $2\frac{1}{2}''$ Strip to represent the funnels. The completed superstructure is fixed to the hull by Flat Brackets, one on each side. One of these can be seen in the illustration.

Two short lengths of wire are used for the masts of the vessel. They pass through the end holes of the compound strip and are anchored to bolts inside the hull.

Parts required to build model liner: 2 of No. 2; 3 of No. 5; 2 of No. 10; 3 of No. 12; 13 of No. 37a; 11 of No. 37b; 2 of No. 48a; 2 of No. 111c.

The travelling crane shown in Fig. 2 will lift small loads, and not only those who possess an Outfit No. 1, from which it is built, but also those with larger Outfits will find it a really good subject for their attention.

The superstructure of the crane is built up on $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, with their ends turned upward, which are joined by two $2\frac{1}{2}''$ Strips bolted in their second and fourth holes. The jib is formed of four $5\frac{1}{2}''$ Strips bolted to the turned up ends of the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The upper ends of the $5\frac{1}{2}''$ Strips are bolted together, with the front pair projecting two holes above the rear pair. A glance at Fig. 2 will make these constructions clear. The bolts carrying the rear pair of $5\frac{1}{2}''$ Strips hold also a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, which is bent round to form the forward part of the control cab and this is completed by attaching in the rear a second $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate bent in the same manner.

The two sides of the jib are then secured together by two Angle Brackets bolted together to form a double bracket, and the bolts passing through the Angle Brackets are used also to fasten in position the two $2\frac{1}{2}''$ small radius Curved Strips that form the outer end of the jib.

The pulley block is built up from two Flat Trunnions bolted together. At the top the Flat Trunnions are spaced apart by putting two washers between them, the bolt passing through the washers, and at the bottom is fitted with a small Loaded Hook.

A Crank Handle is passed through holes in the sides of the cab, and is secured in position by two Spring Clips. A length of Cord is then tied to its shaft and wound around it several times, after which it is passed through the roof of the cab and over a 2″ Rod held in the two Curved Strips. Then it is threaded through the pulley block and finally is tied to the jib.

The crane is mounted on a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate by means of a 2″ Rod and a Bush Wheel. The Bush Wheel is bolted to the two $2\frac{1}{2}''$ Strips that form part of the base of the superstructure, and in its boss is fixed the upper end of the 2″ Rod. The lower end of this Rod passes through the Flanged Plate and a Spring Clip is placed on it to hold the Rod in position. The Flanged Plate is mounted on four rubber tyred 1″ Pulleys.

Parts required to build the model travelling crane: 4 of No. 2; 2 of No. 5; 2 of No. 12; 2 of No. 16; 2 of No. 17; 1 of No. 19g; 4 of No. 22; 1 of No. 24; 18 of No. 37a; 18 of No. 37b; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 1 of No. 57c; 2 of No. 90a; 2 of No. 126a; 2 of No. 155a; 2 of No. 189.

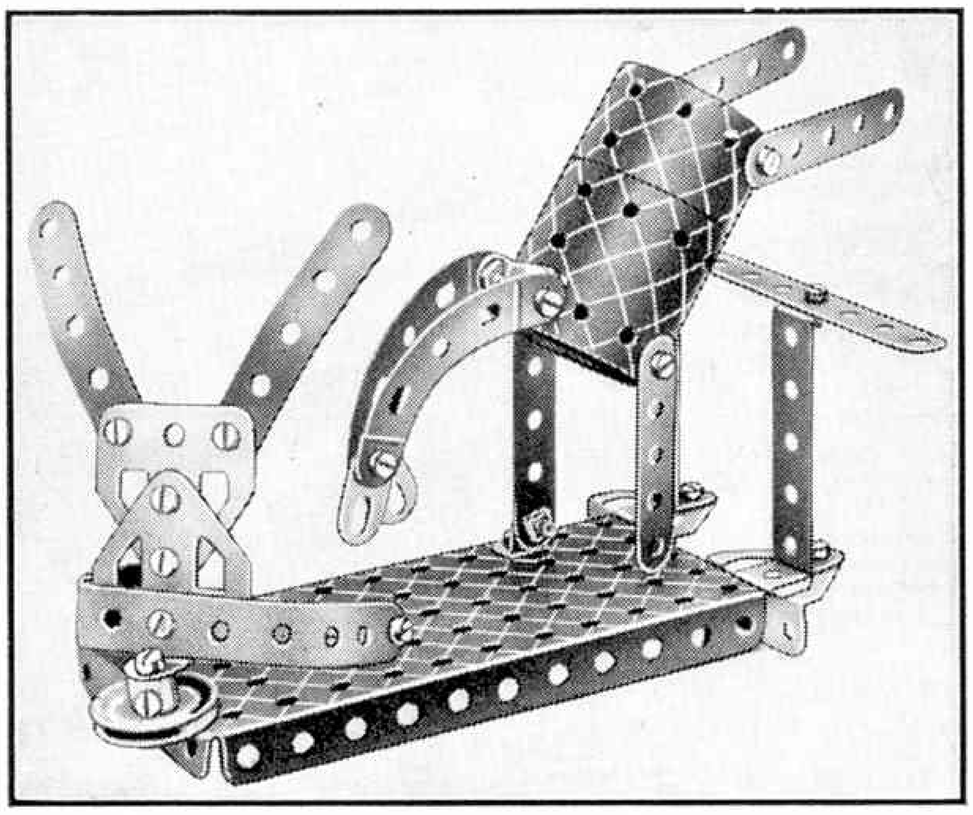


Fig. 1. This model, which depicts a jockey alighting from his horse in rather an unusual manner, is built with Outfit No. 1.

The next model to be described is the humorous little group, depicting a jockey being thrown from his horse, which is shown in Fig. 1. Both the horse and its former rider can be twisted into various positions to suit the fancies of the model-builder or his friends.

This model also can be built from the contents of Outfit No. 1. It is best to commence by building up the horse, the body of which consists of two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates overlapping each other by one hole and bent into the shape of a cylinder. Its legs are represented by four $2\frac{1}{2}''$ Strips, and its neck by two $2\frac{1}{2}''$ small radius Curved Strips. The upper ends of the Curved Strips are joined by a $\frac{3}{8}''$ Bolt, which carries also two Flat Brackets. An Angle Bracket bolted to one of the horse's forelegs serves to secure the animal in position on the baseplate.

The jockey's body is formed from two Flat Trunnions overlapped as shown, and to these are fastened two $2\frac{1}{2}''$ Strips representing his legs and a $5\frac{1}{2}''$ Strip bent round to represent his arms. A 1″ Pulley is used for his head, and it is mounted by a $\frac{3}{8}''$ Bolt on an Angle Bracket bolted to the Flat Trunnions. When completed the jockey also is secured to the base plate by an Angle Bracket.

The model is completed by adding the fence, which consists of a $5\frac{1}{2}''$ Strip supported by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips from two Trunnions bolted to the flange of the base plate.

Parts required to build the model horse and jockey: 2 of No. 2; 6 of No. 5; 2 of No. 10; 5 of No. 12; 1 of No. 22; 23 of No. 37a; 22 of No. 37a; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 189.

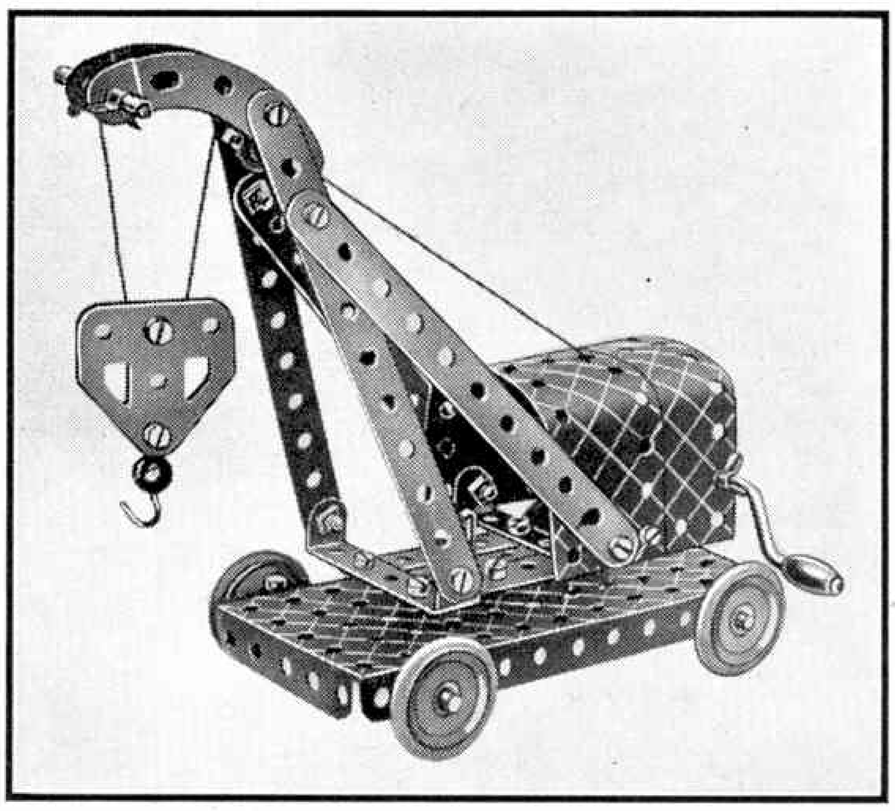


Fig. 2. A neat model travelling crane constructed from the contents of Outfit No. 1.

The model illustrated in Fig. 3 is of a novel type of tricycle in which the two front wheels can be steered from the handlebars. The steering mechanism is very neatly reproduced in the model, which makes an excellent subject for Outfit No. 2. Its construction is commenced by building up the main frame, which consists of two compound strips each formed from a $5\frac{1}{2}''$ Strip and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip overlapped two holes. These side-members are joined across at a point $3\frac{1}{2}''$ from their

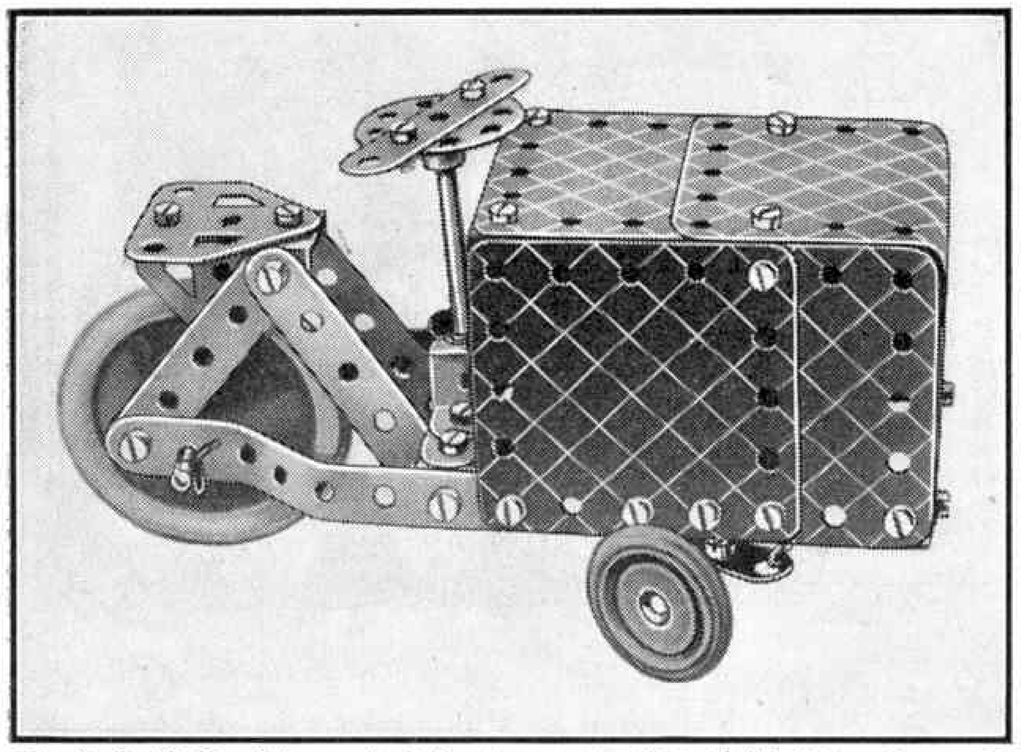


Fig. 3. Outfit No. 2 is required for the construction of this interesting model of a tradesman's tricycle.

rear ends, by a $2\frac{1}{2}''$ Strip and two Angle Brackets. The rear ends of the $5\frac{1}{2}''$ Strips are bent inwards, as shown in the illustration, and in them is journalled a $2''$ Rod that carries a Road Wheel, which forms the rear wheel of the tricycle.

In the end holes of the $5\frac{1}{2}''$ Strips are bolted two $2\frac{1}{2}''$ Strips. These represent the rear forks of the tricycle and to their upper ends are fastened two Trunnions, the bolts holding also two further $2\frac{1}{2}''$ Strips that are not secured at any other point, but when arranged as shown in Fig. 3 give a finished appearance to the frame of model. The saddle, for which two Flat Trunnions are used, is secured in position by a bolt that passes through the flanges of the two Trunnions.

Each side of the container of the tricycle consists of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, which are placed together so that they overlap each other by one hole and are then bolted to the main frame. The top, back and front of the container are formed by a compound plate built up from a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. One end of the compound plate is bolted to the forward turned up ends of the two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips of the main frame. It is then bent as shown and the rear end is secured to the $2\frac{1}{2}''$ Strip joining the sides of the main frame by a Reversed Angle Bracket. The plate is additionally supported at the centre by two Angle Brackets.

The front wheels of the tricycle are mounted as follows. An Angle Bracket is bolted to each side of the container with its free lug projecting inward. A $\frac{3}{8}''$ Bolt is passed through this lug, and a nut is screwed on its shank. Two Flat Brackets and an Angle Bracket are then placed on the $\frac{3}{8}''$ Bolt and locked in position by a second nut. The last-mentioned Angle Bracket provides support for one of the front wheels, which is secured to it by a $\frac{3}{8}''$ Bolt. The Flat Brackets form part of the steering mechanism and must be arranged so that one points forward and the other backwards.

The forward pair of Flat Brackets are joined across by a piece of Cord, the length of which should be adjusted so that the front wheels are parallel to each other. The rear pair of Flat Brackets are also joined by Cord. One end of the Cord is tied to one of the Flat Brackets. The other is passed through the turned up end of the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip at the opposite side of the container, and is then led around a $1''$ Pulley at the bottom of the steering column, through the second Double Angle Strip, and finally is tied to the other Flat Bracket.

The steering column is a $3\frac{1}{2}''$ Rod, which is journalled in the centre hole of the $2\frac{1}{2}''$ Strip that joins the side members of the main frame and also in a Reversed Angle Bracket bolted to the $2\frac{1}{2}''$ Strip. At its lower end it carries the $1''$ Pulley mentioned above, and at its upper end a Bush Wheel. A $2\frac{1}{2}''$ Strip is bolted across the Bush Wheel to represent the handlebars. The steering column is prevented from sliding in its bearings by a Spring Clip, which is pressed on to the Rod between the Reversed Angle Bracket and the $2\frac{1}{2}''$ Strip.

Parts required to build the model tricycle: 2 of No. 2; 6 of No. 5; 4 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 17; 2 of No. 22; 1 of No. 24; 3 of No. 35; 33 of No. 37a; 29 of No. 37b; 1 of No. 40; 2 of No. 48a; 4 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 155a; 1 of No. 187; 2 of No. 188; 2 of No. 190; 1 of No. 191; 1 of No. 200.

The model shown in Fig. 5 represents one of the travelling tower wagons used for repairing overhead tramway wires and lamp standards, etc. It is fitted with a *Magic* Motor, which drives it along at a good speed, and can be built from the contents of Outfit No. 3.

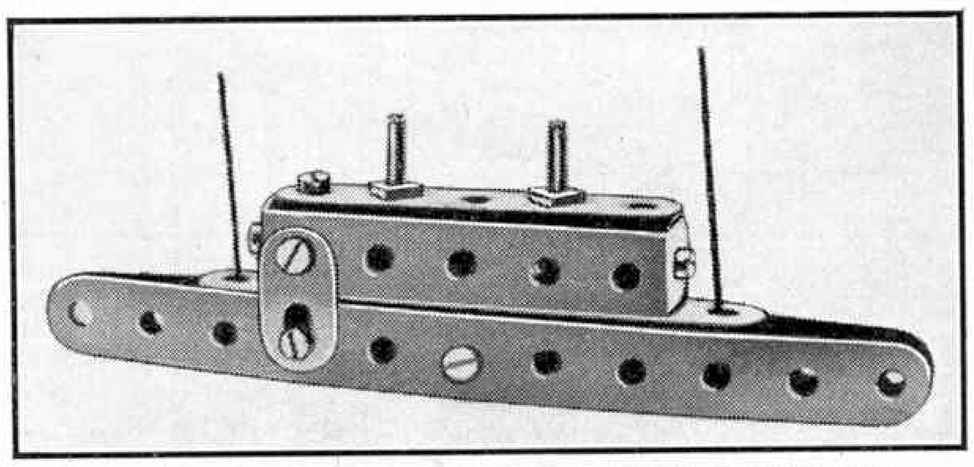


Fig. 4. Only 12 Meccano parts are needed to make this Outfit No. 0 liner.

The chassis of the model consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, on which four $5\frac{1}{2}''$ Strips are mounted vertically by Angle Brackets, as shown in the illustration. Four holes from their upper ends the $5\frac{1}{2}''$ Strips are joined securely by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips and two Trunnions pointing inward. This structure forms the lower fixed part of the tower. The sliding portion consists of two $5\frac{1}{2}''$ Strips that are fastened to a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate at their upper ends by two Reversed Angle Brackets. The Flexible Plate forms the floor of the platform, and the sides consist of two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, which are supported by the remaining free lugs of the Reversed Angle Brackets.

The slides in which the sliding $5\frac{1}{2}''$ Strips move are formed by two Double Brackets 1, which are attached to the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, and two $2\frac{1}{2}''$ Strips 2 mounted at the narrow ends of the Trunnions by Angle Brackets. The bolts passing through the holes in the Double Brackets 1 each carry a Washer inside the Double Brackets. These Washers prevent the sliding $5\frac{1}{2}''$ Strips from springing out of the Double Brackets.

The platform is raised or lowered by a Crank Handle journalled in the third holes from the lower ends of two of the $5\frac{1}{2}''$ Strips forming the fixed portion of the tower. A length of Cord is attached to the centre of the Crank Handle by a Cord Anchoring Spring and wound around it several times. It is then led over a $2''$ Rod journalled in the two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips joining the $5\frac{1}{2}''$ Strips of the tower, and tied to a $3\frac{1}{2}''$ Rod passed through the bottom holes of the $5\frac{1}{2}''$ Strips attached to the platform. The $3\frac{1}{2}''$ Rod is prevented from sliding in its bearings by two Spring Clips. If the model is to work really well, the sliding $5\frac{1}{2}''$ Strips must be thoroughly oiled.

Each side of the bonnet of the lorry consists of three $2\frac{1}{2}''$ Strips secured together by two Flat Brackets. The complete sides are attached to the flanges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, one by a $2\frac{1}{2}''$ Strip and the other by a further Flat Bracket, and they are joined by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate that forms the top of the bonnet. The edges of the Flexible Plate are bent over so that it is easily bolted in position. The radiator is represented by a Flat Trunnion, which is fixed to the forward end of the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate by a Cranked Bent Strip. The cab of the lorry is constructed by attaching a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate to the chassis by an Angle Bracket. The ends of the Flexible Plate are bent round to form the sides of the cab. How this is done can be seen in the illustration. The roof of the cab is a 1 11/16" radius Curved Plate fastened to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate.

Two $3\frac{1}{2}''$ Rods are used for the axles of the wagon. The forward one is journalled in holes in two $1\frac{1}{4}''$ Discs bolted to the sides of the bonnet, and it carries two $1''$ Pulleys fitted with Rubber Rings. The Pulleys are each spaced from the $1\frac{1}{4}''$ Discs by a Washer. The rear axle revolves in the centre holes of two $2\frac{1}{2}''$ small radius Curved Strips, which are secured to the flanges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The axle carries a $\frac{1}{2}''$ Pulley and this is connected to the driving pulley of the *Magic* Motor.

Parts required to build model tower wagon: 6 of No. 1; 8 of No. 5; 5 of No. 10; 2 of No. 11; 8 of No. 12; 3 of No. 16; 1 of No. 17; 1 of No. 19g; 4 of No. 22; 4 of No. 35; 56 of No. 37a; 50 of No. 37b; 6 of No. 38; 1 of No. 40; 1 of No. 44; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 6 of No. 111c; 2 of No. 125; 1 of No. 126a; 4 of No. 155a; 1 of No. 176; 2 of No. 188; 2 of No. 189; 2 of No. 190; 1 of No. 191; 1 of No. 199; 20 of No. 217b. 1 *Magic* Motor (not included in Outfit)

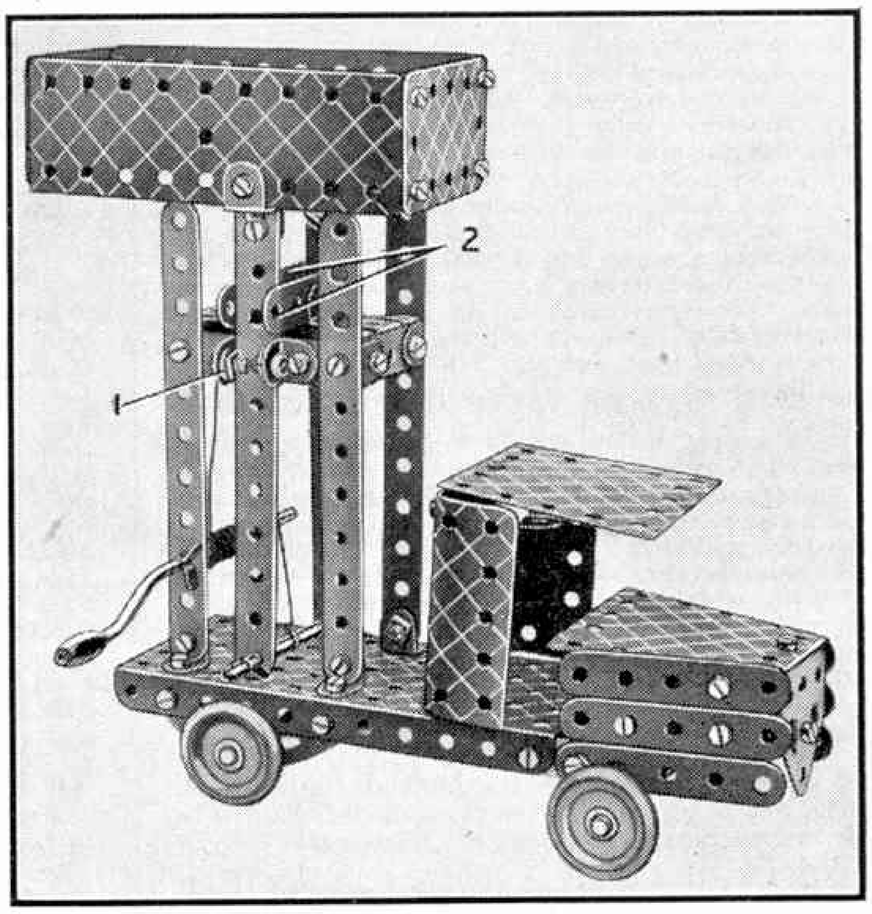
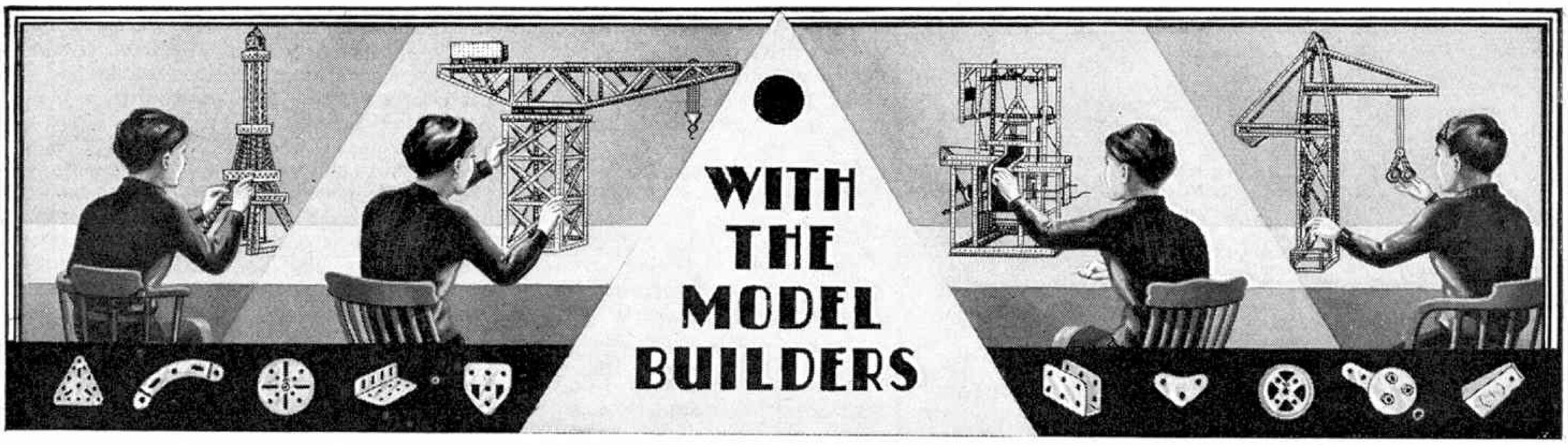


Fig. 5. An interesting Outfit No. 3 model of a tower wagon of the type used for repairing overhead tramway wires.



A MECCANO MOTOR CHASSIS FITTED WITH A PETROL ENGINE

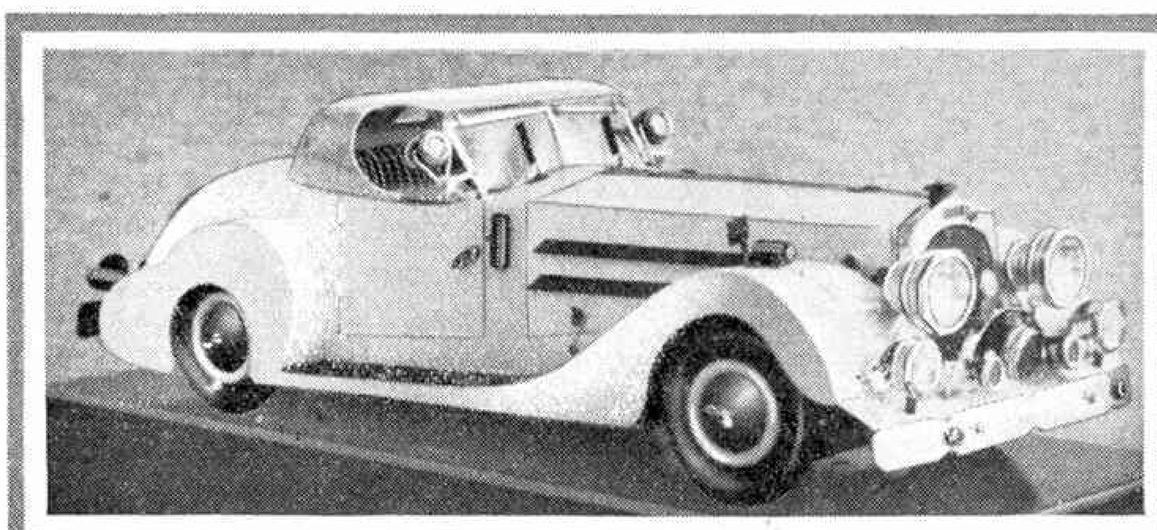
The two illustrations at the centre of this page show an extremely interesting model of a car built by Iain H. Gardner, Glasgow W.1. The model is 28½" long and 11" wide, and took a year to complete, but this is not surprising when the large number of unusual features that the car possesses are taken into account. The chassis is built up from Meccano parts and is similar to the one described in Special Instructions Leaflet No. 1a, but instead of being fitted with an Electric Motor as a power unit it has a 15 c.c. single-cylinder petrol engine that runs at 3,000 r.p.m. The petrol tank, coil and condenser of the ignition device are fitted at the rear of the chassis.

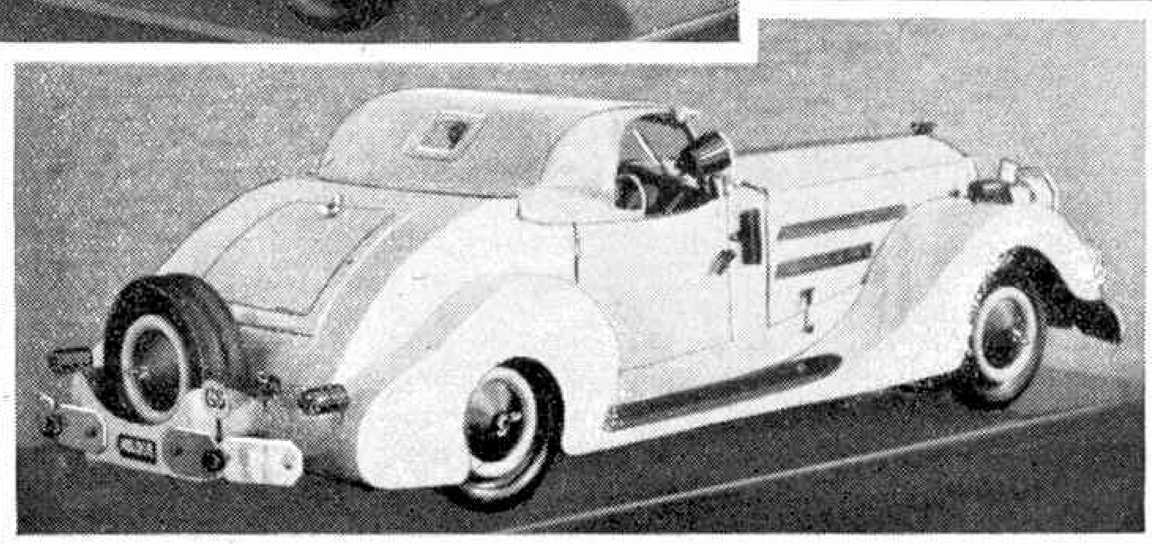
Another unusual feature of the car is that a three-valve wireless set is mounted on the chassis. The controls for the set are fitted behind the driver's seat, and the batteries are concealed beneath the stand on which the car is mounted.

The bodywork is carried out in tin sheet, which was cut to shape, and the pieces were then soldered together. This was no easy task, and every reader will appreciate the skilful way in which Gardner has completed it. Luggage boot, opening doors, folding hood and bonnet are provided and the car is enamelled in cream and red. Parts such as the radiator, bumper and windscreen frame are chromium plated. The doors are lined with ¼" thick wood to make them more solid.

Inside the car the seats, floors and doors are upholstered in red leather, and a correctly-designed dashboard is fitted. The dash instruments are represented by watch dials, and two of them have holes cut through their centres so that oil and ignition bulbs may be seen. These bulbs do not work in conjunction with the engine, but they add to the realistic appearance of the car.

On the dash are mounted also the switches for the windscreen wipers and the lights, while the electric horn is operated from a push button on the steering column. Altogether there are 16 lights. Six of these are mounted at the front, and the rest are accounted for by interior, dash and rear lights.





A fine model car, built on a chassis constructed entirely of Meccano parts. The model is driven by a 15 c.c. petrol engine, and is fitted with a three-valve wireless set. It is the work of Iain H. Gardner, Glasgow W.1, and is fully described on this page.

A SIMPLE TYPE OF VALVE OPERATING GEAR

In a recent letter R. Purton, Boreham Wood, Herts., put forward a suggestion for a neat type of valve operating gear that could be used on a small model steam engine, in which the valve is mounted above the cylinder. The links between the piston rod and valve operating rod consist of a 3½", a 4½" and a 1½" Strip, which are joined together in that order by lock-nutted bolts. The free end of the 3½" Strip is pivotally attached to the piston rod by means of a Collar and a lock-nutted bolt, and the free end of the 1½" Strip is similarly attached to the valve operating rod. The 4½" Strip is pivoted in the third hole from its upper end on a bolt fastened to a 1"×1" Angle Bracket that is bolted to the front of the cylinder.

The lengths of the links can of course be adjusted to suit the model on which they are being used.

A NOVEL IDEA FOR A DOUBLE SUSPENSION CRANE GRAB

G. R. Harris, Bexley, Kent, has devised a simple form of double suspension crane grab that can be used on cranes designed to lift light loads. Two Rods acting as winding drums are provided, a few inches apart, in the crane jib. One of these accommodates the hoisting cord, and the other the cord that controls the opening and closing of the grab. The second drum is geared to the Motor or Crank Handle. The Rods forming the drums are provided with Sprocket Wheels, which are joined by a length of Sprocket Chain that is not taut but has about an inch of slack. When the Motor is switched on, the Rod carrying the grab control cord completes about half a turn before the drive is transferred to the hoisting drum. This half turn is sufficient to close the grab before it starts moving. For opening the grab when it has been hoisted the hoisting drum is provided with a strap brake. This holds the grab in position while the Motor is reversed to turn the second hoisting drum and so open the grab. The brake must then be released before the grab can be lowered.

SHIP FITTINGS

Model ship-building with Meccano is extremely fascinating, as many readers have discovered, and one of its greatest charms lies in the fitting of deck details that will give a finished appearance to the model. The Meccano range does not include any specific deck fittings, but it is possible to use many of the ordinary model-building parts for representing the more important deck fittings. For instance bollards can be represented realistically by Collars, or by a number of Washers, or on small models by Threaded Pins. A capstan can best be made by removing the Spring from a Meccano Spring Buffer (Part No. 120a) and securing the Buffer to the deck by means of a nut. For a winch a good plan is to secure a Handrail Support to the deck, and secure a 1" Rod through its plain hole. A ½" Pulley is then secured on one end of the Rod and a ½" diam. Pinion on the other. Alternatively the 1" Rod can be supported by a Double Bracket if a Handrail Support is not included in the Outfit.

A neat rail around the edge of the deck adds much to the appearance of a model, and one can easily be fitted by securing short Screwed Rods or ¾" Bolts to the deck and suspending Cord between them. The Screwed Rods will be too thick for a small model, and they should be replaced by short lengths of wire anchored to convenient bolts. The collapsible rail of a warship may be represented by means of Sprocket Chain.

Life-boats are a distinguishing feature of any ship, and they can be built up neatly from Strips. Two Strips, the length of which will be determined by the size of the model, are needed for each life-boat. They are curved slightly, and their ends are joined by ⅜" Bolts. In a very large model the life-boats can be represented in a more detailed fashion by using Flexible Plates. Readers interested in small scale models should examine the model of the "*Queen Mary*" illustrated on page 50 of the January "*M.M.*" In this model the life-boats are very ingeniously represented by Flat Brackets that have been bent double.

AN INGENIOUS REVERSING GEAR

I. Scott, Carlisle, possesses a No. 7 Outfit and recently found that he would have to construct a reversing gear in order to complete a model successfully. As his Outfit contained only a Worm, two ½" diam. Pinions and a 57-teeth Gear, he was at first puzzled as to how he was going to do this, but eventually succeeded in building a compact reversing gear from the parts at his disposal. Details of this gear are given below.

The Worm is fastened on the end of the driving shaft, and two 3½" Rods are journalled at right angles to it, one above and the other below the Worm. The 3½" Rods are spaced so that the ½" Pinions fastened on them will gear with the Worm, and are connected together by means of a 1" Pulley, a ½" Pulley and a Driving Band. A 2½" Strip is slipped also over the ends of the 3½" Rods and held in place by Collars, so that the Rods can be slid backwards and forwards in their bearings.

The next task is to adjust the ½" Pinions on their Rods so that it is possible to put either of them into mesh with the Worm by pushing in or pulling out the 2½" Strip. This is easily done and all that remains now is to fix another Rod in position, so that a 57-teeth Gear on it will mesh with the ½" Pinion on the lower 3½" Rod. The 3½" Rod is the final driven shaft, and its direction of rotation can be changed by sliding the coupled 3½" Rods so as to bring the disengaged ½" Pinion into mesh with the Worm.

The direct drive from the Worm through the lower ½" diam. Pinion to the 57-teeth Gear on the 3½" Rod is, of course, the more positive of the two, and if possible it should be arranged so that this drive is the one used for heavy work. For instance, if the reversing gear were being used on a model crane, the direct drive would operate the hoisting drum while the load were being raised, and the drive through the upper ½" diam. Pulley and the Driving Band would come into operation when the load were being lowered.

A REVERSE DRIVE WITHOUT GEARS

Sometimes it is necessary to arrange a reverse drive between two shafts in a straight line. It is quite easy to do this without Gears if the following system is used.

A Coupling is fixed on the end of each shaft by means of its middle transverse bore. To one end of each Coupling a Swivel Bearing is attached by a ½" Bolt passed through its "spider" and gripped by a Grub Screw of the Coupling. The Swivel Bearings are joined by a Rod, which passes at its centre through the middle transverse bore of a third Coupling supported by two Rods locked in its longitudinal bore. The two last-mentioned Rods must be free to move in their bearings, and must be on the same level as the two Rods between which the drive is being arranged. When the mechanism has been fitted up, it will be found that the Swivel Bearings are in diametrically opposite positions, so that when one of them is revolved, the other is turned in the opposite direction.

"New Year" Model-Building Competition

A Competition for Beginners in the Meccano Hobby

Here is a competition that has been arranged specially for young model-builders with only small Outfits, and particularly those who have not yet taken part in any of the "*M.M.*" competitions. At this time of the year there are always thousands of newcomers to the Meccano hobby, and this contest gives them a fine opportunity, which they should not miss, of increasing their Outfits by winning a valuable prize of Meccano parts.

This Contest is open to all readers under 14 years of age on the closing date of the competition, which is 29th April, and it does not matter whether they live in the British Isles or any other part of the world.

Each competitor may choose his own subject for his model and may use any size of Meccano Outfit up to and including Outfit No. 6. No parts may be used that are not included in Outfit No. 6, but either Clockwork or Electric Motors may be used to drive models if desired.

When the model is completed an illustration of it is required. This may be either a drawing showing the principal features, or better still a photograph. If the competitor cannot make a satisfactory drawing or cannot obtain a photograph of his model himself, these may be prepared by others, but it must be clearly understood that the model itself must be the competitor's own unaided work.

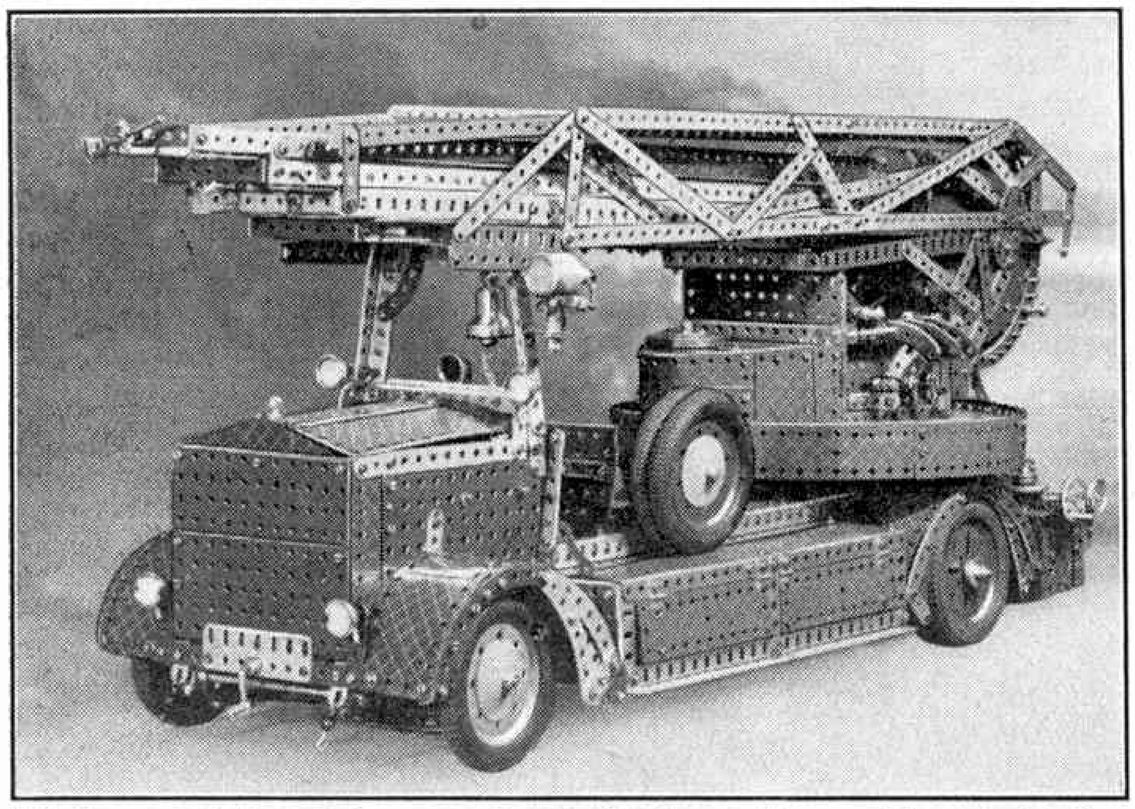
The competitor should write his age, name and address, and state the size of Outfit from which the model was constructed, on the back of the photograph or drawing, and then send it to "*Junior Model-Building Competition,*" Meccano Ltd., Binns Road, Liverpool 13. Entries must be posted in time to reach Liverpool not later than 29th April.

If the model has novel features that are not clearly shown in the photograph or drawing submitted, a brief explanation may be desirable. This should be written on a separate sheet of paper and sent along with the illustration.

To ensure that each competitor will have an equal chance the models will be judged by experts familiar with the capabilities of the various Meccano Outfits, and they will seek specially for models that represent interesting subjects and which are built as strongly as possible with the parts available in the Outfit used.

The following prizes will be awarded to the builders of the models decided to be the best received. First, Meccano or Hornby products value £3/3/–; Second, products value £2/2/–; Third, products value £1/1/–. Five prizes of products value 10/6 and five of products value 5/–.

All young model-builders will realise the splendid opportunity this contest provides to win a handsome prize for a few hours' pleasant work, and we urge them to set to work on their models immediately so that they will not spoil their chances by having to rush their preparations as the closing date draws near.



This fine model is typical of many modern fire-fighting machines used in up-to-date fire brigades. It was built by L. Willington, Birmingham, who was awarded a prize for it in the "Grand Summer" Model-Building Competition.

Still Time to Win a Valuable Cheque

In last month's "*M.M.*" we published particulars of the "New Year" Model-Building Contest, in which cheques and a large number of other valuable prizes are offered for the best models submitted. The closing date of the Contest is 31st March, and as there is still plenty of time for readers to send in their entries, we are again giving full details of how these should be prepared and submitted.

The competition is open to all model-builders, and is so arranged that no matter how young a boy may be, or how small his Outfit, he will stand just as good a chance of winning one of the splendid prizes offered as older competitors with large Outfits at their disposal. Every model builder who has not yet begun to prepare his entry should do so now, and a special invitation is given to all who have not previously taken part in "*M.M.*" competitions.

Entrants can choose their own subjects, and models of aeroplanes, cranes, all kinds of motor vehicles, machines and architectural subjects are all suitable for this competition. Any size of Meccano Outfit or any number of parts may be used, and there is no age limit or restriction of any kind.

The actual model built for entry must not be sent. Instead it is only necessary to forward a good photograph or, if this is not possible, a good drawing. A small photograph will do, provided it is clear enough to show the details of the model, and neither photographs nor drawings need be prepared by the competitor himself. The model itself, however, must be the result of the competitor's own unaided efforts.

The competitor should write his age, name and full address on the back of the photograph or drawing, and enclose it, together with a brief description of the model, in an envelope addressed "*New Year Model-Building Competition,*" Meccano Ltd., Binns Road, Liverpool 13.

Entries must be posted in time to reach this office not later than 31st March. Any entries received after that date will be held over for the next suitable competition.

The prizes to be awarded for the best and most interesting models received include valuable cheques and Meccano and Hornby products, and the chief of these are as follows: First, Cheque for £5/5/–; Second, Cheque for £3/3/–; Third, Cheque for £2/2/–. Other prizes are 10 consisting of Meccano or Hornby products to the value of 10/6 each, and 10 of products value 5/–.

It should be noted that photographs or drawings of models that win prizes become the property of Meccano Ltd. Unsuccessful entries, however, will be returned to readers provided that a stamped addressed envelope is included for that purpose.

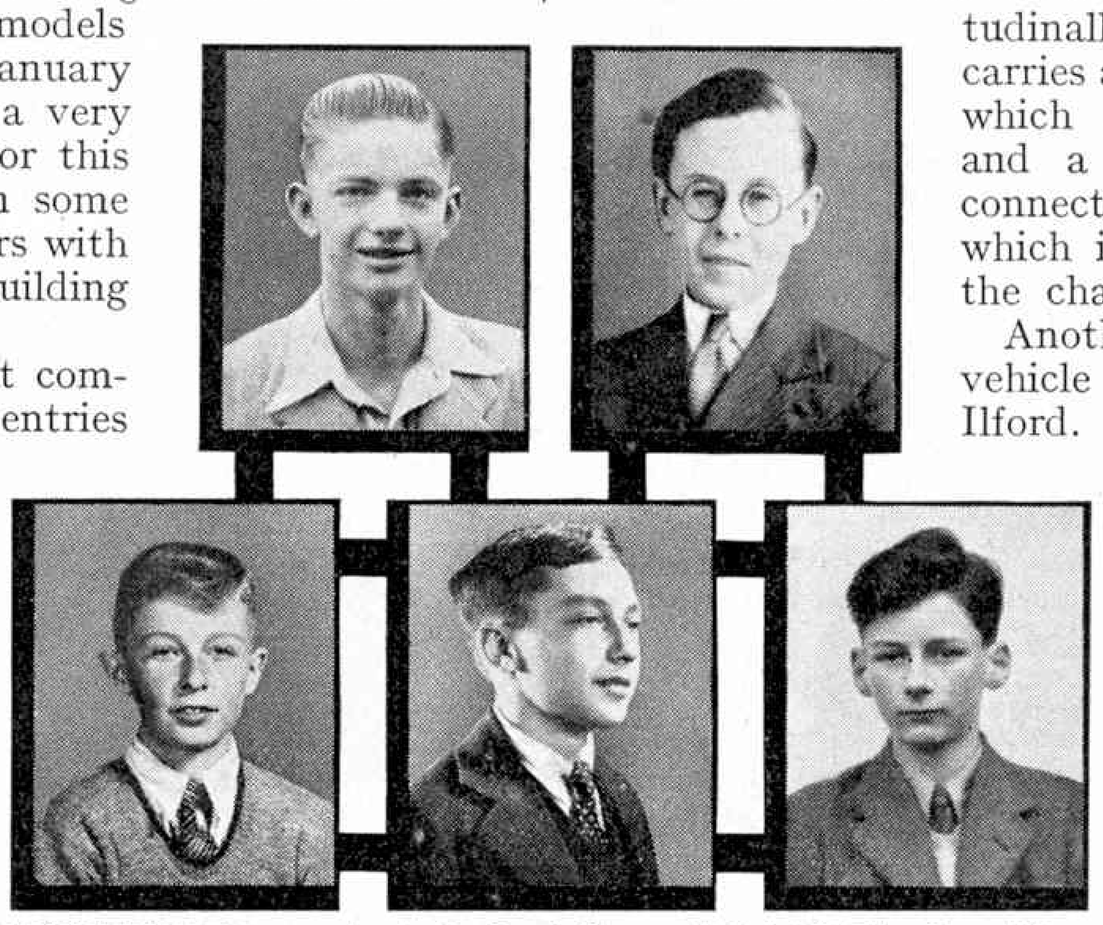
Grand "Summer" Contest Results

By "Spanner"

Further Comments on Prize-winning Models

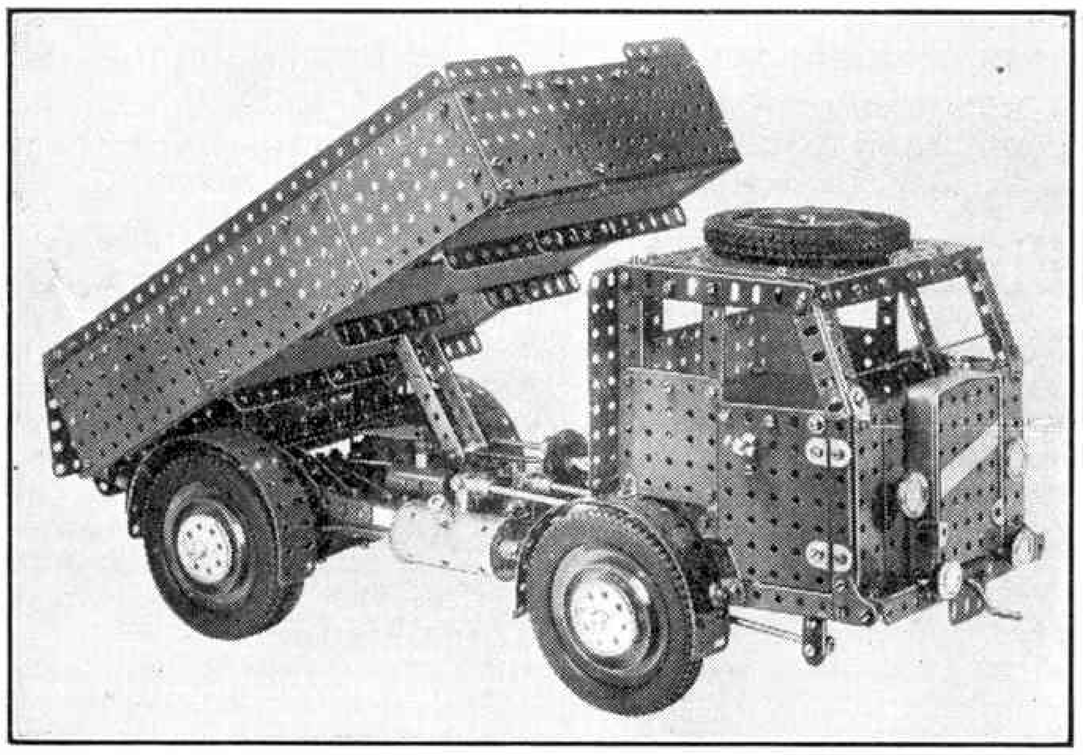
THIS month I continue my description of the fine models that won prizes in the "Summer" Model-Building Competition. As will be gathered from the photographs and details of models already published in the January "*M.M.*," the entries covered a very wide range of subjects, and for this month's article I have chosen some that I hope will provide readers with ideas for their future model-building activities.

One of the largest and most complicated models among the entries was a fine level-luffing travelling crane built by J. Willems, Antwerp. This model is illustrated on the opposite page and I am sure readers will agree that it is a very fine piece of work. Every part of the construction is carried out neatly and with full regard to strength and rigidity, and the mechanical details of the operating mechanism show that Willems has a sound knowledge of the principles on which cranes of this kind are based. Regular readers of the "*M.M.*" will be familiar with other examples of Willems' work, for several of his models have been illustrated in past issues.



Model-builders who won prizes in the Grand "Summer" Model-Building Competition. In the top row, reading from left to right, are C. Sharpe, Ilford, and C. Brown, Bradford, while in the bottom row are R. van Berkum, Fenwick, Ontario, A. Aikman, Steyning, and I. Cross, Motherwell.

There were as usual many interesting models of various kinds of motor vehicles among the entries, and some of these are particularly attractive on account of the large amount of detail work incorporated in them. One of the best is the model tipping lorry illustrated on this page. It was built by A. Aikman, Steyning, who is a regular competitor in "*M.M.*" competitions, and represents a modern forward control Diesel-engined lorry used for heavy haulage work. The model is capable of carrying a load of 40 lb. and is driven by an E6 type Electric Motor. Features of the chassis are Ackermann steering gear, single plate clutch, three-speed and reverse gearbox, differential and mechanism for tipping the body.



A model of a tipping motor lorry that won a prize for A. Aikman, Steyning.

The drive to the tipping mechanism is taken from a $\frac{1}{2}$" Pinion on the end of the clutch shaft, which engages a further Pinion on a shaft fitted with a sliding Dog Clutch. The latter is controlled by a hand lever placed near the driver's seat, and movement of this engages a $\frac{1}{2}$" Pinion with a 57-teeth Gear on a Threaded Rod mounted longitudinally in the chassis. This Rod carries also an Octagonal Coupling, to which are secured two $3\frac{1}{2}$" Strips, and a second Octagonal Coupling connects the Strips to the body, which is pivoted at its rear end to the chassis.

Another well-built model motor vehicle was that sent by C. Sharpe, Ilford. It represents a heavy eight-wheeled lorry of the type used for transporting rolls of newsprint, and its main features include differentials for each pair of driving wheels and brakes on the four rear wheels. Each of the four front wheels is fitted with steering mechanism and each is independently sprung.

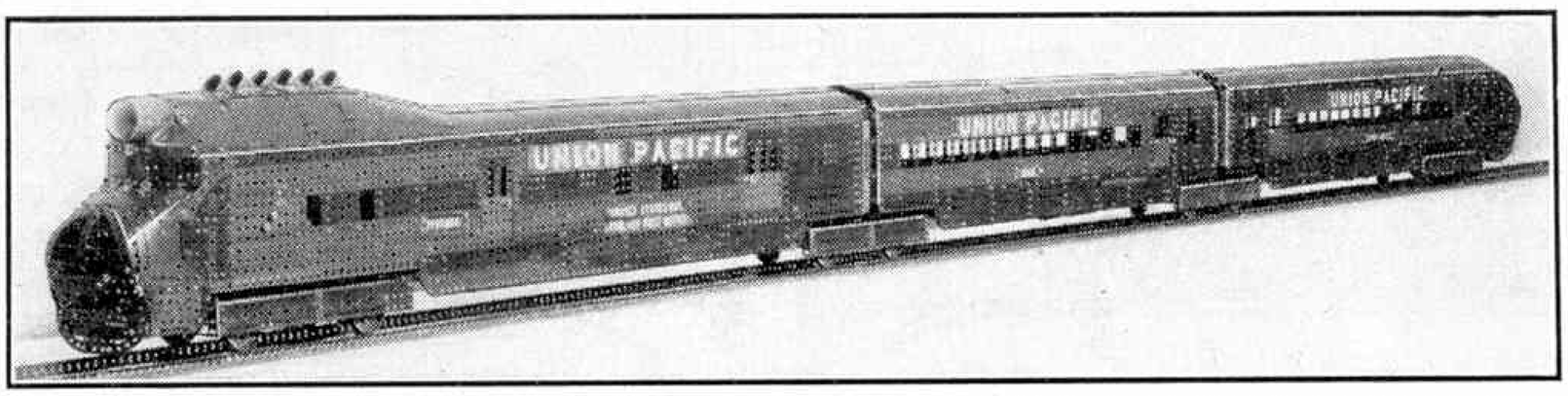
L. Willington, Birmingham, is to be congratulated on his good work in building a fine model fire-engine. It was exceptionally well-built and I liked particularly the constructional details of the escape, which when fully extended reaches a height of 8 ft. 7 in. The chassis is equipped with all the usual fittings and mechanical details, including jacks for steadying the vehicle when the escape is raised while the machine is standing on uneven ground.

R. van Berkum, Fenwick, Ontario, sent a model of a type very different from any of those already mentioned. It represents a four-horse mail coach of days gone by, and although very simple in construction, its builder has managed to obtain an appearance of realism that often is lacking in simple models of this kind. His success was due, I think, to his care in selecting the few parts he used, and to the good proportions of the model.

A model of one of the latest mobile anti-aircraft guns, complete with army transport lorry, was the subject of the entry sent by C. Brown, Bradford, and I. Cross, Motherwell, won a prize for his good work in building a steam breakdown crane of the type used in railway

service operations. Both of these competitors owe their success to neat and careful workmanship.

Several competitors submitted entries consisting of two or more models, and one of these was C. G. Jones, Cheadle Hulme, who sent three models comprising a horizontal engine, a tower and an open touring car. Of these I liked best the engine, but all three were strongly built and evidently were the result of many hours' patient work. I shall look forward to seeing further models from this competitor in future contests.



A well-proportioned model of a streamlined train in service on the Union Pacific Railway, U.S.A. It was built by H. G. Shorten, Winnipeg, Canada, and was described in the January issue of the "M.M."

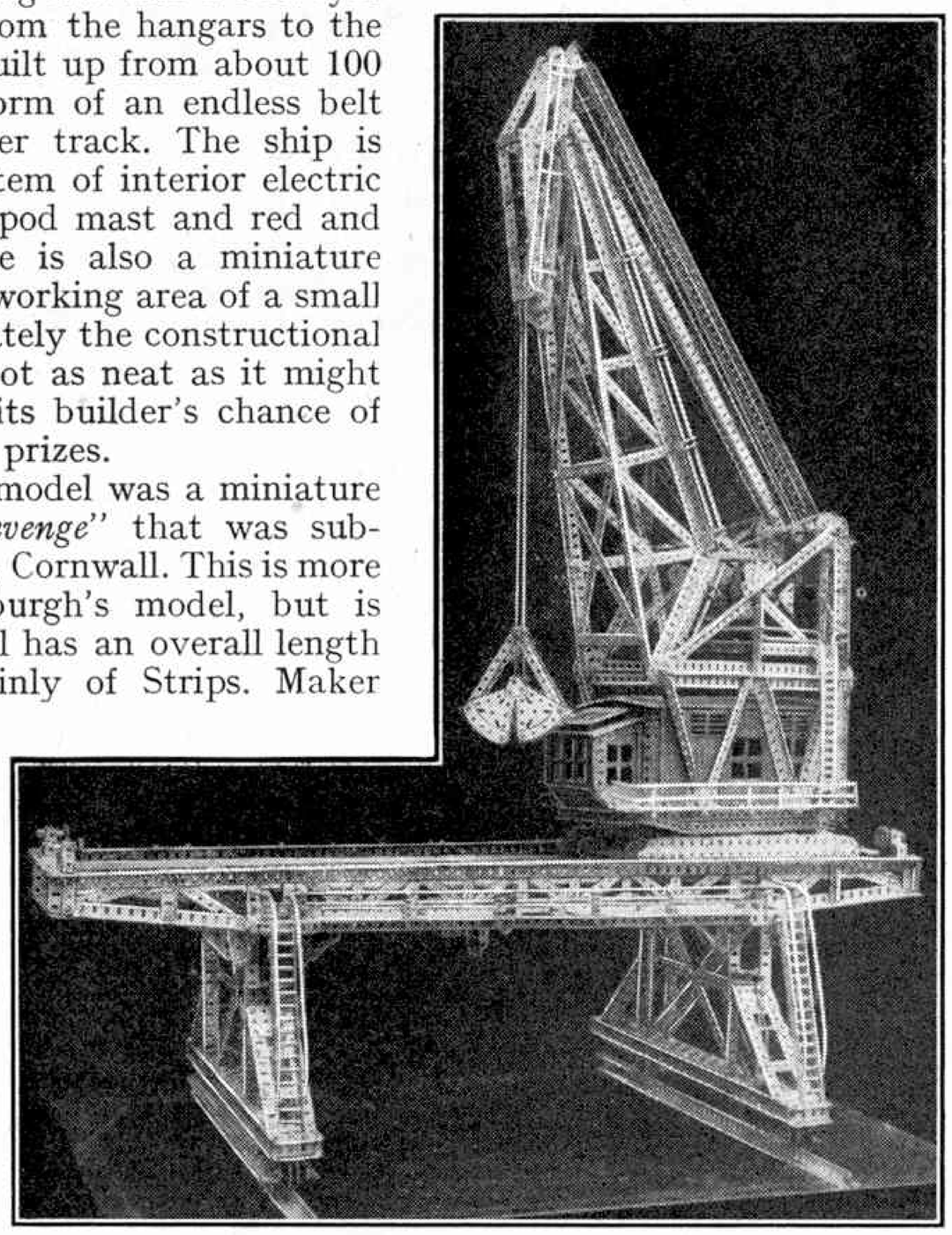
Among the models that won the smaller prizes was an interesting representation of H.M. Aircraft Carrier *"Eagle,"* built by R. Myburgh, Claremont, Cape Province, South Africa. Myburgh based his model on the cover illustration of the July 1934 *"M.M.,"* and tried to reproduce the vessel to scale as far as possible. Among the most interesting features of his model are working lifts and a conveyor for bringing the aeroplanes from the hangars to the flight deck. The conveyor is built up from about 100 $3\frac{1}{2}$" Strips assembled in the form of an endless belt somewhat similar to a creeper track. The ship is equipped with a complete system of interior electric lights, a searchlight on the tripod mast and red and green navigation lights. There is also a miniature floodlight for illuminating the working area of a small deck crane at night. Unfortunately the constructional work in Myburgh's model is not as neat as it might have been, and this reduced its builder's chance of winning one of the principal prizes.

Another prize-winning ship model was a miniature of the battleship H.M.S. *"Revenge"* that was submitted by F. Maker, Callington, Cornwall. This is more neatly constructed than Myburgh's model, but is lacking in detail work. The hull has an overall length of 5 ft. and is composed mainly of Strips. Maker informed me that the model was entered in a Hobbies Exhibition contest at his school, and was successful in winning the Second Prize, although it had to compete with over 100 exhibits of all kinds.

I have often stressed the advisability of finding novel subjects for competition models, particularly if the Outfit at one's disposal is only a small one. A typical instance of the value of this advice was the success that attended the efforts of A. Muff, Canterbury, New Zealand, in the "Summer" Competition. This competitor sent a simple model of a road grading machine, and although this is not so imposing as many of the models that failed to win prizes, the subject is so unusual and the details and actions of the actual machine are reproduced so faithfully that it attracted instant notice from the judges.

Competitors must not think, however, that models of the more popular subjects, such as locomotives, ships or bridges, are not favourably considered. Actually models of this kind are among the finest subjects for Meccano, but in view of their great popularity they must be particularly well-built, or must possess novel constructional features, in order to attract the attention of the judges. These features were present in two model tank locomotives built by W. G. Stainer, Bournemouth. In one of these the boiler is built from Flexible Plates, while in the other a rather more uniform effect is obtained by using Strips for this purpose. The valve mechanism on each engine is neatly represented by pivoted Strips and Buffers and Train Couplings give the locomotives a finished appearance.

G. Shorland, who is a member of Exeter Meccano Club, sent a model of Exeter Museum, and had the distinction of being one of the few competitors who chose architectural subjects for their models. Shoreland's model is $5\frac{1}{4}$ ft. in length and, although it is very imposing in size and is quite well built, it has a rather plain and unreal appearance that spoilt its chance of winning a higher award. Architectural subjects must be chosen very carefully if they are to make realistic models. Generally it is best to select a building that has plenty of exterior detail work and few large blank wall spaces, otherwise it is difficult to give "life" to a model of this kind.



This level-luffing travelling crane was built by J. Willems, Antwerp, who was awarded a Special Editor's Prize.

Results of "Sharp Eyes" Contests Nos. 2 and 3

The prizes offered for the best and most neatly prepared solutions of the puzzle pictures that appeared on pages 402 and 464 of the July and August 1938 issues of the *"M.M."* respectively have been awarded to the competitors named in the following lists. Several all correct entries were received in each contest, and the prizes therefore were awarded in order of merit to the senders of the most neatly prepared of these.

"Sharp Eyes" Contest No. 2.

First Prize, Meccano or Hornby products value £3/3/–: R. Roddick, Rosario de Santa Fe, Argentine. Second, products value £2/2/–: F. Cooper, London S.W.19. Third, products value £1/1/–: R. Biggs, Bristol 6.

Products value 10/–: C. Barnard, Johannesburg; C. Keekok, Singapore; E. Hooper, Exeter; K. Costain, Bolton; D. Murison, Buenos Aires.

Products value 5/–: C. Wrayford, Bovey Tracey; J. Gnanadurai, Trichinopoly, S. India; H. Hussey, St. Helens; H. G. Johnston, Southall; L. Slater, Portsmouth.

"Sharp Eyes" Contest No. 3.

First Prize, Meccano or Hornby goods value £3/3/–: H. G. Johnston, Southall. Second, products value £2/2/–: J. Whitcomb, Pirbright. 3rd, products value £1/1/–: C. Keekok, Singapore.

Products value 10/–: C. Barnard, Johannesburg; K. Lack, Sheffield 7; H. Hussey, St. Helens; A. Mohamedbhai, Zanzibar, B.E. Africa; C. Wrayford, Bovey Tracey.

Products value 5/–: L. Slater, Portsmouth; W. Jones, Birmingham 1; A. Khand-Wala, Karachi; D. Murison, Buenos Aires; E. Robertson, Whitehaven.



Games and Model-Building Competitions

This month club members are settling down to the steady work of the second Winter Session, with the delights and excitements of the holiday season well behind them. There is no need for regret at this, however, for club programmes can be kept as lively as ever, and Leaders in particular should take care to introduce variety and to encourage competition among the members. Competitive games such as Table Tennis should not be overlooked, and regular knock-out tournaments should be arranged. Special emphasis also should be laid at this time of the year on model-building competitions of various kinds, such as simplicity contests and others of an amusing variety.

Blindfold model-building is great fun. In this entrants are shown a very simple model, and are then blindfolded and asked to complete the model, the necessary parts being laid out in front of them. A model such as the simple liner illustrated and described on page 113 of this issue would form a good subject for a contest of this kind.

Another form of competition that should be tried is "Packet Building." In this competitors are given a parcel containing the parts that they are allowed to use, and are required to design and build a model with them. The excitement of a contest of this kind is increased if a time limit is imposed. The judges should take into account the merits of the finished models as regards design and construction, but also should give points for ingenuity in making use of the parts provided. To leave any of these out should be regarded as a fault.

The Guild Correspondence Club

An encouraging sign of increasing Guild activity during the past year has been the steady growth of the Correspondence Club. To-day there are more Meccano boys than ever in regular communication with each other, and firm friendships are being formed between Guild members in many different parts of the World. One particularly interesting feature is that correspondence has led in many instances to actual meetings, and Meccano boys in this country have actually travelled overseas to Holland and France to stay with their correspondents in those countries, after which return visits have been arranged.

At the present moment correspondents are wanted particularly in Canada, South Africa and the United States. Guild members in those countries, especially new ones, are therefore urged to write immediately for entry forms.

Merit Medallions in 1938

This month I publish my usual list of Merit Medallions awarded during the past year. I am delighted to find that this is much more extensive than in previous years, the number of Medallions awarded being 100, the largest since 1932. The list is an excellent one, including members of clubs from all parts of Great Britain and the Empire, and I take the opportunity of congratulating all who have won this award, the highest open to Meccano boys.

Last month I spoke of my determination to make 1939 a record year, and this splendid list, which shows that enthusiasm is running high among club members, is an excellent omen. I shall not be satisfied unless the list for the present year is even more extensive and representative, and urge Leaders who have not yet taken sufficient advantage of the award to keep it in mind and to let me have their nominations at the end of each quarter. In each club two Medallions are available quarterly, and there is no restriction on the kind of service that can be recognised by the presentation of Merit Medallions. All that is necessary is that the recipient shall have done something that has helped to make his club more efficient or better known, so that recruiting, steady work in an official capacity, the organisation of special features, the introduction of new ideas, and long and steady service are all qualifications.

Merit Medallions Awarded in 1938

BARKING—D. Hughes, D. Johnson. BURNLEY (Todmorden Road Central School)—W. Cooper, L. Lang. CHELMSFORD (Great Baddow)—K. J. Avis, A. R. Cooke. CHESTERFIELD (Mary Swanwick)—F. Massey, K. Vickers. EDINBURGH (Edinburgh Hobbies Club)—S. J. Cairns, N. Innes, R. Kirkhope, M. McMichael, J. Moffat, G. Patterson, I. Stonehouse, A.Tait. (St. Giles Schoolboy Model Club)—W. Chayne, J. du Bois, G. Kerr, J. C. A. McNaught, G. Sims, A. Turner. ("Twenty-eight")—I. A. Magnusson, P. H. Sutherland. EXETER—Mr. M. C. Hodder, H. E. Moore, C. Norman, R. Perrell, K. Robinson, R. Saunders, G. Shorland, A. Spiller, P. H. Willey. GLASGOW (Morison Memorial)—R. Bruce, J. Muir, J. Wilson. HORNSEA—P. Thom. ISLANDMAGEE—A. English, I. Forsythe, T. Hunter, C. McCalmont, D. McCalmont, W. McCalmont, B. McCready, S. McCready, T. Maitland. JERSEY (The Beeches)—N. G. Blackwell, B. Dubras, H. Dubras, P. Le Febvre, R. Le Marquand, D. Nicolle. KIDDERMINSTER—H. Bamfield, D. Flynn. LONDON (Old Charlton)—D. Lambert, K. Morphew. (Winchmore Hill)—J. A. Piejus. MAIDSTONE (Sutton Valence)—G. Flynn, P. Smith. NEWARK (Mount Senior School)—E. Blundy, E. Foster, A. Kemp, E. Masding. PLYMOUTH—R. E. Emdon, D. Horswell, R. Mitchelmore, D. Oxland, J. S. Stephens. SALTASH (St. Stephen's)—B. R. J. Braund, L. R. Saunders. SIDMOUTH (Sid Vale)—P. E. W. Taylor. THORNTON HEATH (St. Oswalds)—P. A. G. Broughton. WEST CALDER (Breich)—M. Anderson, R. Lumsden.

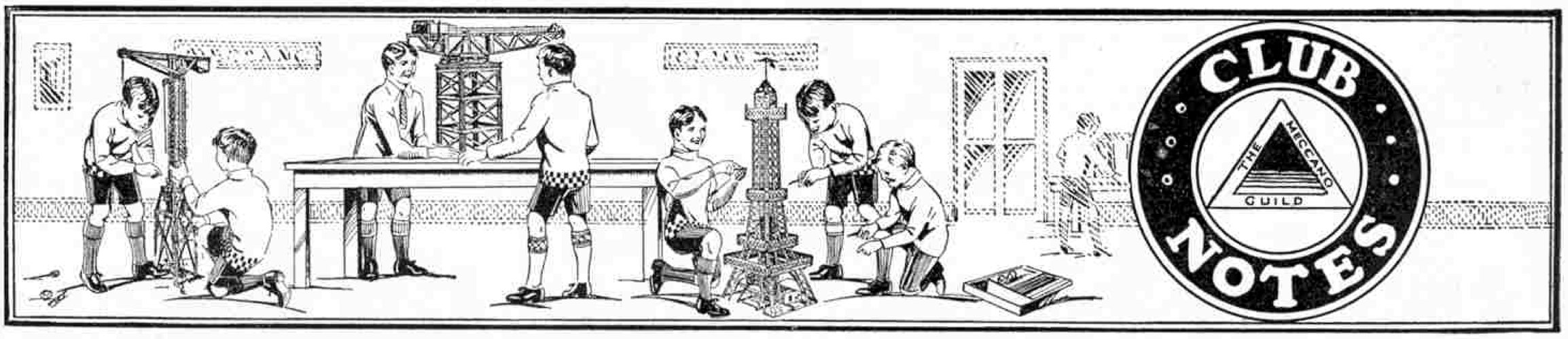
OVERSEAS CLUB MEMBERS

AUSTRALIA (Maylands)—J. Knight, R. Knight, R. Le Cheminant, R. Patterson, B. Penn, C. Petersen, W. Petersen, S. Press, H. Rickman, G. Winnett. (Thebarton Technical School)—B. Clark. CANADA (Rosemount, Regina)—G. Hardwick, C. Pearce. EGYPT (Cairo)—J. H. Awad, M. Bekheet, S. A. Nader, M. K. Salem. INDIA (Ranjit, Lahore)—A. Singh. NEW ZEALAND (Ashburton)—E. Lewis, M. Kruse. (Christchurch)—L. Dennis, D. McLaren. SOUTH AFRICA (Malvern)—M. Cowling, M. Leach. (Pioneer)—L. Alley, G. Everton.

Two Attractive Exhibitions

The Holy Trinity (Mildmay) M.C. are holding their Annual Exhibition on Friday and Saturday, 17th and 18th February. On the first day the Exhibition will be open from 6.30 to 9.30 p.m., and on the second from 3 to 9.30 p.m. The display will take place in the club's new hall at Mildmay Centre, Newington Green Road, London N.1, and on both occasions will be opened by Dr. Cochrane, President of the club. There will be an excellent display of models built by members and other models on loan from Headquarters, and light refreshments will be available. Tickets, adults 6d., children 3d., can be obtained from H. C. Boyes, 37, Mackenzie Road, Beckenham, Kent.

The Exhibition of the Kidderminster Club takes place in the Clubroom, Railway House, Prospect Hill, Kidderminster, from Monday 27th February to Saturday 4th March. On weeknights the opening time is 6.45 p.m. and on the Saturday there will be three displays, at 2.30, 6.30 and 8.30 respectively. The attraction will include a film show. The charge for admission for children is 2d., and there will be a silver collection for adults.



Exeter M.C.—The usual high standard of model-building has been maintained, outstanding models being a Tudor Period house and an air liner. Several new games have been introduced at meetings, and Corinthian football, darts, draughts and pin snooker are now played regularly. Association football has been continued with renewed vigour after the Christmas orgies! Club roll: 80. *Secretary:* J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

Heath Grammar School M.C.—A Model-building Competition has been held in which members had to construct models incorporating not more than 100 nuts. An equally interesting contest was a handicap layout designing competition, held on a Hornby Train Night, in which members were allowed varying numbers of rails with which to lay an original track. Inter-group darts matches have been held, and one meeting closed with a sing-song. Arrangements for the future include a descent of a colliery, a Lecture by a local stationmaster, and a trip to the Yorkshire Electric Power Station at Thornhill. Club roll: 51. *Secretary:* M. W. Bottomley, 6, Craven Terrace, Hopwood Lane, Halifax.

Barking M.C.—Prizes of Meccano parts were awarded in a Model-building Competition, the ages and experience of members being taken into account by judges. An excellent suspension bridge and a field gun were among the entries. On one evening members were formed into groups, each of which constructed part of a large model that was afterwards assembled. A Hornby Evening was a pleasant diversion, and many trains were run on a large continuous layout with a number of sidings. Table Tennis and a Spelling Bee were the chief items of an enjoyable Social Evening. A Cinematograph Show featured Charlie Chaplin and "*Popeye*," and also included a film of an ice hockey match. A very happy Social Evening was spent on the occasion of the Club's second birthday. Club roll: 32. *Secretary:* F. K. Whitehead, 60, Devon Road, Barking, Essex.

St. Stephen's (Saltash) M.C.—The club stock of Meccano has been enlarged by purchase and by gifts. A fine Meccano Traction Engine has been built. The Model Section is engaged in the construction of models of St. Paul's Cathedral and a Handley Page air liner, and an overhead signal cabin is being reconstructed. Miss D. Bearblock has been elected President in place of Miss Porter, who has left the district. The club was represented at the Plymouth M.C. Exhibition. Club roll: 6. *Secretary:* B. R. J. Braund, 9, Homer Park, Saltash.

Regent Street Central School (Heywood) M.C.—Mr. Greenwood gave a Lantern Lecture on "*The Preservation of the Countryside*," and Mr. Chaplin gave one on "*London*" that included views taken on various school excursions. The usual club activities have been continued, including a Boxing Competition. A large number of Meccano models were displayed at the Annual Exhibition and Concert, prizes being awarded for the best three. The Concert was very lively and successful. Club roll: 150. *Secretary:* L. Mathews, 2, James Street, Heywood.

Sid-Vale M.C.—Regular Model-building Contests have been held, in which the subjects included "Guns," "Aeroplanes," "Railway Transport Vehicles," and "Farm Implements." Many excellent models were entered, and competition was very keen. Parents were present at the General Meeting, and four new members were enrolled. Club roll: 10. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

Hornsea M.C.—Good attendances at recent meetings are evidence of the attractive character of the programme. In addition to the regular features, it has included Lectures and Talks by members and by visitors, Film Shows, both educational and amusing, and a variety of games. Subjects dealt with in Talks and Lectures have included "*The Weather Forecast*," "*Cement*" and "*The African Jungle*." Club roll: 14. *Secretary:* P. Richardson, "Summerleigh," Esplanade N., Hornsea.

Old Charlton M.C.—The varied programme followed has included a Beetle Drive, a Debate and Model-building. The subject for one Model-building Night was a mouse trap, and many ingenious models were devised. Several model steam engines were brought along to one meeting and carefully examined. A Progressive Games Evening left members breathless but happy. An Odds and Ends Model Evening was held, cardboard, cotton reels, tins and other oddments being used to build models of a locomotive, a marine flying base and other useful subjects. A further interesting issue of "*The Meccanic*," the club magazine, has been produced. Club roll: 20. *Secretary:* D. C. Lambert, 23, Charlton Lane, Charlton, London S.E.7.

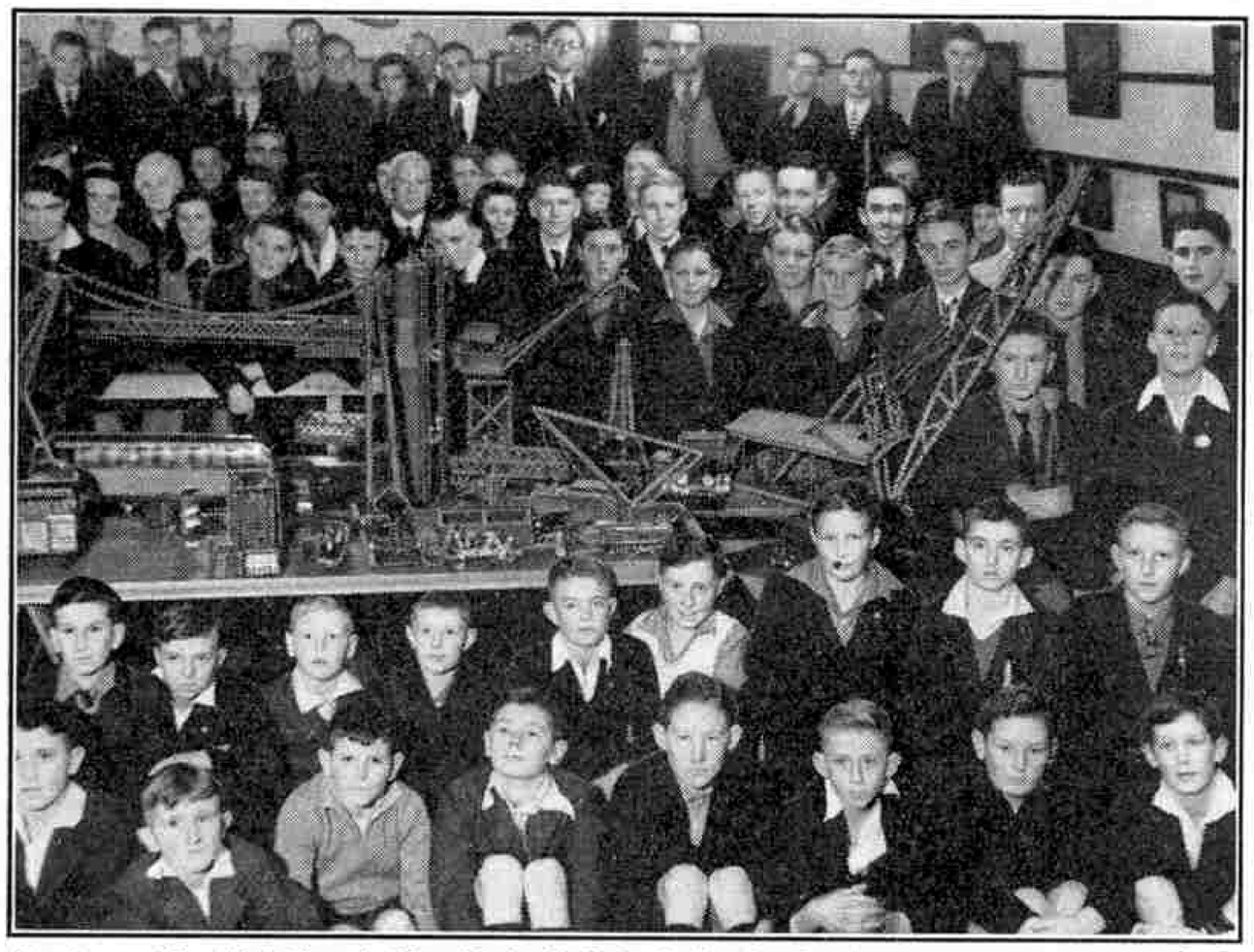
St. Oswalds (Thornton Heath) M.C.—A good Meccano motor chassis and a mechanical truck have been built. Members enjoyed an instructive Talk on "*Aeronautics*" and a Cinematograph Show, and a Mock Trial provided a diverting evening. Stamp discussions have been held, and Games Evenings are to be included in future programmes. Club roll: 25. *Secretary:* J. F. Jaques, "El Molino," 5, Ingram Road, Thornton Heath, Surrey.

Islandmagee M.C.—The Concert given recently was greatly enjoyed by all present, the performances of members being greatly appreciated, and was so popular that it is to be held annually. Meccano models built have included a block-setting crane, tower wagon and pithead gear. Members of the Junior Section devised an ingenious crane, and the Fretwork Section have been very busy. Club roll: 18. *Secretary:* S. McCready, "Hillmount," Islandmagee, Co. Antrim.

Winchmore Hill Collegiate School M.C.—The Exhibition and Variety Show held recently was an outstanding success. A fine array of models was entered for the Model-building Contests, prizes being won by representations of a dance band, a funicular railway, a mechanical horse and trailer, and a battleship. A working model railway added to the attraction of the Exhibition, and an entertainment, including songs, sketches, musical items and an ever-popular "puzzle corner" also was given, and well received. Club roll: 28. *Secretary:* F. J. Hearn, 143, Conway Road, Southgate, London N.14.

Bridport Grammar School M.C.—An excellent Exhibition of models by members was held recently. A Meccanograph and a gantry crane attracted particular attention. The Woodwork, Metalwork and Stamps Sections are flourishing. Club roll: 40. *Secretary:* M. F. Tighe, 39, St. Andrew's Road, Bridport.

Stretford Public Libraries M.C.—Meetings of the Meccano and Hornby Train Section have been well attended, and a number of excellent models built. Train running has been enthusiastically carried out on both clockwork and electric tracks. Further interesting additions have been made to the scrap books. Two popular Lantern Lectures dealt with "*A Visit to Holland*" and "*From the Ark to 'Queen Mary'*" respectively. A Concert and Games Evening was greatly enjoyed. The Stamp Section is thriving, and many stamps donated have been distributed among members. Unusual stamps have been carefully traced with the aid of reference library books. The Cigarette Card Section also is very active. Club roll: 35. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.



Members of the Christchurch (New Zealand) M.C., Acting Leader, Mr. E. A. Gay, secretary, S. S. Stringer, with parents and friends at their recent Annual Social. Part of the fine display of Meccano models can be seen, while there was also a Hornby electric layout in operation. The Christchurch M.C. was affiliated in May 1930. Members are keen model-builders, and a special feature of club life is the friendly rivalry with the Ashburton M.C. An Inter-Club Shield awarded for competition in model-building between the two clubs is at present held by the Christchurch M.C.

Plymouth M.C.—A Parents' Evening has been held, when parents were able to look round the club while the usual activities were in progress. A Library has been formed. A Visit has been paid by members of the St. Stephen's (Saltash) M.C., who invited members to attend their recent Exhibition. A party of members accepted the invitation and greatly enjoyed the event. The club's own Annual Exhibition was of the usual high standard, and was a well-merited success. Club roll: 86. *Secretary:* A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

EGYPT

Cairo M.C.—Pleasant meetings have been held, and a highly satisfactory standard of model-building maintained. The Woodwork Section has been especially active, while the Stamp, Football and Cycling Sections have all amply justified their existence. The Leader has visited Syria and Palestine, calling on other clubs there, with very happy results. A Library has been formed. Club roll: 35. *Secretary:* Sayed Fahmy Awad, 28, El Gezawi Street, Shoubra, Cairo, Egypt.

AUSTRALIA

Thebarton Technical School M.C.—The club has been able to purchase the cine-projector for which it has been saving for several years. An excellent folding screen has been made by members, and several entertaining Lectures have been given on such subjects as "*Kites*," "*Electric Clocks*" and "*Making Electric Light Globes in Australia*." A large Meccano electric clock has been made to operate from the 210 volt mains supplying the clubroom, where it now occupies the place of honour. Large stocks of Meccano parts were added to the club's outfit recently. Members have visited the local automatic telephone exchange, the yards of a Port Adelaide timber merchant, and Wunderlich Tileries. Club roll: 81. *Secretary:* B. S. Clarke, 21, Victoria Street, Glandore, South Australia.

Maylands M.C.—The club concert was given with characteristic enthusiasm. The programme included orchestral pieces, sketches, musical items, songs and humorous turns. The concert concluded with a performance by the Mouth Organ Band, making its last public appearance. Mr. Patterson, leader of the Band, was presented with a silver cigarette case in recognition of his services. Model-building has been carried on with the usual intensity, and fine displays of models were staged at the Factions and Session Exhibitions. Games tournaments have been keenly contested. Mr. Priestly, a supporter of the club, has given a series of Lectures on various types of engines. Club roll: 37. *Secretary:* W. Petersen, 1, Warne St., Maylands, Western Australia.

Melbourne M.C.—Busy evenings have been spent with the club's model railway layout, which incorporates 6-volt and 20-volt tracks. Tinplate track that has been in service for six years has been replaced with steel track, giving more efficient train running. New sidings have been added, and a new 20-volt locomotive has been tried out. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote, N.16, Victoria.

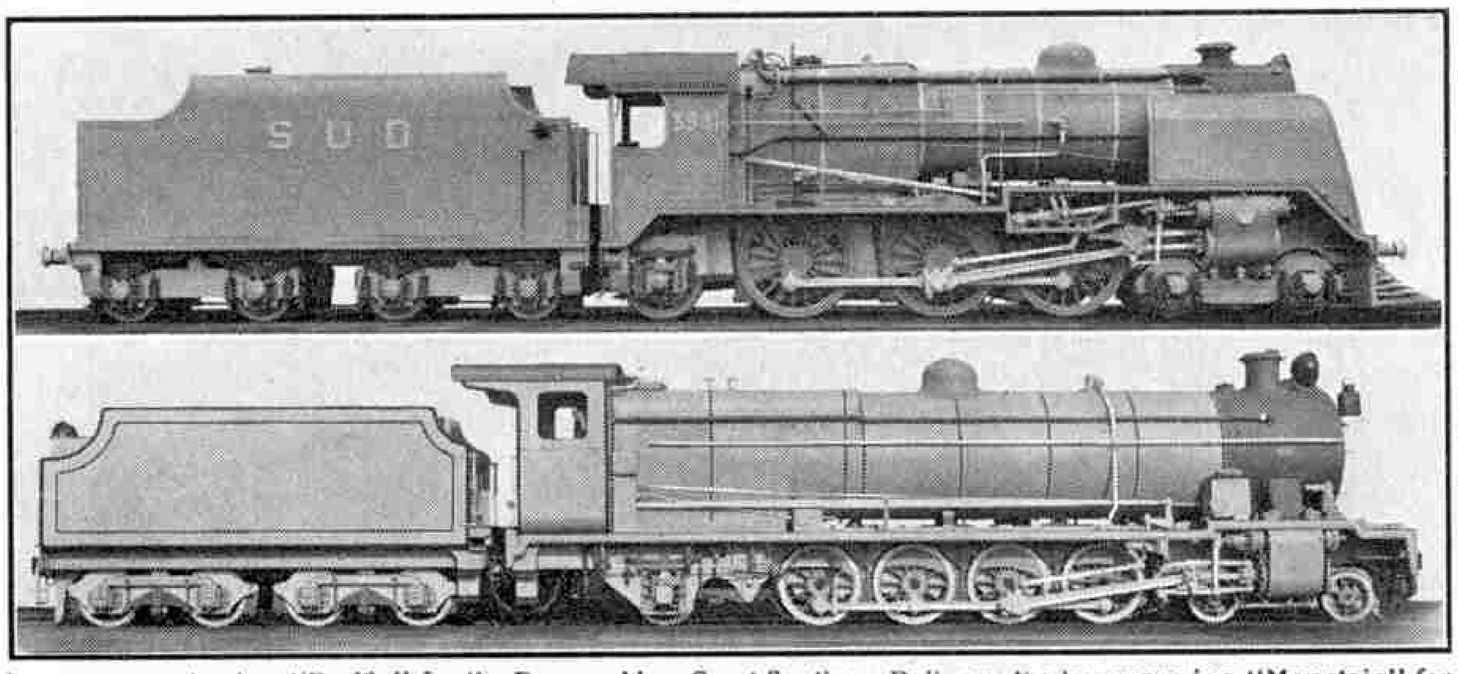
British-Built Locomotives for Overseas

Modern Engines for Argentine and Gold Coast

By a Railway Engineer

THE illustrations in the page show two splendid examples of British locomotive engineering that have recently been built by the Vulcan Foundry Ltd., of Newton-le-Willows, Lancs., for service overseas. The upper engine in the illustration is a handsome "Pacific" for the Argentine, and below it is a "Mountain" type locomotive for the Gold Coast. Readers will probably find a brief description of each of these two types of engines interesting. I will deal with the "Pacific" first; this and its sister engines are intended principally for the express services on the main lines of the Buenos Aires Great Southern Railway radiating from Buenos Aires.

Train speeds in Argentina are not high by British standards, but the new engines could, if need be, give an excellent account of themselves. A striking point in their outward appearance is the short chassis, reminiscent of the "Super-Pacifics" of the former Northern Railway of France, and so unlike the Gresley and Stanier 4–6–2s of the L.N.E.R. and the L.M.S. respectively. The boiler barrel too is short, but this in combination with large tubes should make for excellent steaming. There are only two cylinders, 19 in. in diameter by 28 in. stroke; in this feature, a comparatively small diameter and a long stroke, the engine follows the English G.W.R. tradition, a comparison that is made still more interesting by the use on the B.A.G.S. engines of the favourite G.W.R. working pressure of 225 lb. per sq. in.



The upper engine is a "Pacific" for the Buenos Aires Great Southern Railway; the lower one is a "Mountain" for service on the Gold Coast lines. For these photographs and for information contained in this article we are indebted to the makers, the Vulcan Foundry Ltd., Newton-le-Willows.

The Argentine standard gauge is 5 ft. 6 in., and locomotive designers in this country may well envy the greater cross-sectional space available. In the new engines the piston valves are 10 in. diameter, larger than any it has yet been possible to accommodate on a British "Pacific."

In common with most Argentine locomotives these new "Pacifics" are oil-fired. Until fairly recently the South American lines relied to a very large extent on imported coal, mostly from South Wales; but the difficulty of obtaining supplies during the Great War and during the subsequent labour troubles led to local timber being used as a fuel on many less important workings. Efforts also were made to develop the natural oil resources of that continent. As a result the B.A.G.S., in collaboration with the Buenos Aires Western and the Buenos Aires Pacific Railways, acquired an oilfield of their own at Comodoro Rivadavia.

With oil-firing it is possible to keep a locomotive cab in the state of cleanliness traditional in a ship's engine-room, and in this case the interior is painted pale green. At night the cab is electrically lighted; the same power supply is also used for the big electric headlamp. The locomotives themselves are finished in black, lined out in blue and white, a distinctive livery that sets off their bold and workmanlike appearance. The total weight of the engine alone in working order is 88½ tons, of which 54 tons represent the adhesion weight; the tender weighs 67¾ tons loaded, and carries 6,000 gallons of water and 11 tons of oil. The vacuum brake is used, as might be expected in a country where British railway influence is strong.

In addition to its passenger traffic the Buenos Aires Great Southern handles a large quantity of grain. One of the disadvantages of Argentine grain is its humidity, and this enterprising railway has erected at San Enrique station a grain-drying plant to which the farmers can bring their produce and have it treated before sending it to the coast by rail. This process not only cheapens the freight charges, by removing superfluous weight, but also ensures a better price being obtained per unit weight of grain sold. Another seasonal traffic that demands a high standard of locomotive performance is the result of the huge annual fruit crop of the Rio Negro valley. At its peak this business necessitates the running of six or seven fruit specials every day, each one having to be worked at express speed over the 750 miles from Cipoletti to Buenos Aires. The new "Pacifics" should be ideally suited to long through workings of this kind.

The Gold Coast is probably known best to the majority of readers by its postage stamps, as a unit of the Colonial Empire lying somewhere in equatorial West Africa. It is a comparatively small territory, and the coast line from which it derives its name stretches for roughly 300 miles along the very middle of the Gulf of Guinea. From Accra and Takoradi, its two principal ports, railways run northward to converge at Kumasi, the capital, some 170 miles inland. These two main routes are laid to the gauge that is standard in practically the whole of South and West Africa, namely 3 ft. 6 in. Including various branches the total route-mileage on the 3 ft. 6 in. gauge is about 500, and over this system between 80 and 90 steam locomotives are at work.

More than three-quarters of the total earnings of this Government-owned railway is derived from goods traffic. The annual cocoa crop accounts for nearly half the freight train revenue. Other important products of the Colony are manganese ore, used increasingly nowadays in the manufacture of rails, and timber. Much of this diverse goods traffic is heavy, and to help in dealing with it striking "Mountain" locomotives, as shown by the lower engine in the illustration on this page, have been put in service. Some of these new engines have been built by Nasmyth, Wilson and Co. Ltd., of Patricroft, Manchester, and others by the Vulcan Foundry Ltd., of Newton-le-Willows. The Nasmyth Wilson engines differ from those from the Vulcan Foundry in being built on bar frames.

A first glance at the photograph suggests a gigantic locomotive; actually, for the particular wheel arrangement, the new engines are unusually small. The coupled wheels are only 3 ft. 9 in. in diameter, and are grouped so closely together that the wheelbase is only 12 ft. 9 in. long; the extreme shortness is better appreciated by comparison with other eight-coupled types, such as the standard L.M.S. 2–8–0s, the rigid wheelbase of which is 17 ft. 3 in., or "*Cock o' the North*" on the L.N.E.R., which boasts 19 ft. 6 in. The Gold Coast lines, though for the most part substantially laid, run through equatorial forest, or tropical grasslands; there is much sharp curvature and a long rigid wheelbase would be out of the question. The axle loading is very light too, amounting to no more than 52 tons distributed over the four coupled axles.

The two cylinders are 19¼ in. in diameter by 24 in. stroke, but this comparatively small size gives a nominal tractive effort of 23,500 lb. at 85 per cent. of the working pressure, which is 180 lb. per sq. in. A vivid contrast is obtained by comparing the total weight of the engine alone, in working order, with that of Britain's biggest 4–4–0; the Gold Coast "Mountains" weigh 74¼ tons; the Southern "Schools" 67 tons.

From the illustration the boiler appears to be very long in relation to its girth. A feature that helps to give the impression of great length is the combustion chamber in the fore part of the fire-box, which extends for a distance of 3 ft. ahead of the front of the grate. The point where the fire-box ends is just discernible in the illustration, almost in line with the hindmost point of the tyre of the rear pair of coupled wheels.

The new engines are painted dark red and are lined out in black and gold, the standard livery of Gold Coast locomotives.

A Well-Arranged Hornby Layout

Features of Operating and Scenic Interest

AN attractive feature of the miniature railway hobby is the variety of ways in which it appeals to its followers. Some layouts are arranged mainly for the running possibilities they afford, others bear witness to their owners' interest in signalling, or scenic effects, and so on. The most satisfactory however are those in which there is a nice balance between the various interests, and a good example of a well-arranged system of this kind is that described on this page. This has been developed by Mr. H. W. Jones of Purley, Surrey, for the use of his son, who in the accompanying photograph is seen busy with the layout, and obviously enjoying himself!

The growth of the railway has followed the usual lines. First came a small clockwork-operated railway that was gradually expanded. Conversion to electric working followed, and subsequent developments resulted in the present form of the system. This is permanently laid on a baseboard occupying a room that has been specially allotted to it. The room measures 12 ft. by 10 ft., and full advantage has been taken of the opportunities afforded by this space in the development of a realistic and workmanlike Hornby railway.



The "Operating Superintendent" of the railway described on this page. In addition to the railway operations, the scenic interest and road traffic are notable features of the line.

The layout takes the form of two ovals, each consisting of double track, which run round the room. There is in addition a branch line, which diverges from the main system and divides into two sections, one of which forms a dead-end siding, the other serving the locomotive depot. Independent control of different trains is afforded on the two main parts, each of which forms a separate electrical section, supplied with current by its own Meccano Transformer. Connections between the various tracks by means of Crossover Points make it possible to run a train from the outside track right through to the innermost one, and vice versa.

The whole layout is arranged on a raised baseboard which has been carefully planned to suit the track system and to allow the inclusion of satisfactory lineside effects. The latter is a point that is sometimes overlooked when the details of a miniature railway are being worked out. The baseboard covers a great deal of the area available, but there are two "pits" or openings cut in it to form an operating space. These are placed so that access is afforded from them to all parts of the layout. An unusual feature, which adds to the completeness of the railway room, is that seats are provided on one side of the system from which visitors can view operations in comfort.

Joint traffic working is favoured, as can be seen from the illustration, both G.W.R. and L.N.E.R. locomotives being available. The most important passenger trains are made up of No. 2 Special Pullmans, and usually are hauled by a Hornby L.N.E.R. E320 Locomotive "*Flying Scotsman.*" Freight traffic, which is handled by the G.W.R. E220 Special Tank Locomotive, is carried in an assortment of Wagons and Vans numbering about a dozen in all. A complete breakdown train is also kept in readiness for any emergency. This usually is in charge of an L.N.E.R. No. 1 Tank Locomotive, which is used also for shunting and local "pick-up" goods traffic and is a handy unit for miscellaneous duties.

Apart from the interest of the railway traffic and control, the "setting" of the line has been given a good deal of attention and a most realistic result has been secured. A great feature of the line is the inclusion of many accessories of various kinds, and also of Meccano Dinky Toys. Lighting is provided by means of Hornby Lamp Standards, and this gives a very pleasing and realistic effect. Miniature houses have been placed in suitable positions, and a modern touch is added by the inclusion of two Dinky Toy Aeroplanes suspended above the layout. Hornby Paled Fencing and Trees have also been included to form the boundary of the railway premises and also to add to the general effect of the scene.

Two stations are included in the layout. One with an island platform is situated on the inner loop; the other is on the outer loop, and forms a through station of the ordinary type. Both passenger and goods trains are dealt with at the stations, which receive their shares of each kind of traffic, and a "real" atmosphere is created by the inclusion of various station accessories, such as platform machines, luggage and seats, and especially by the addition of Dinky Toy Station Staff and Passengers.

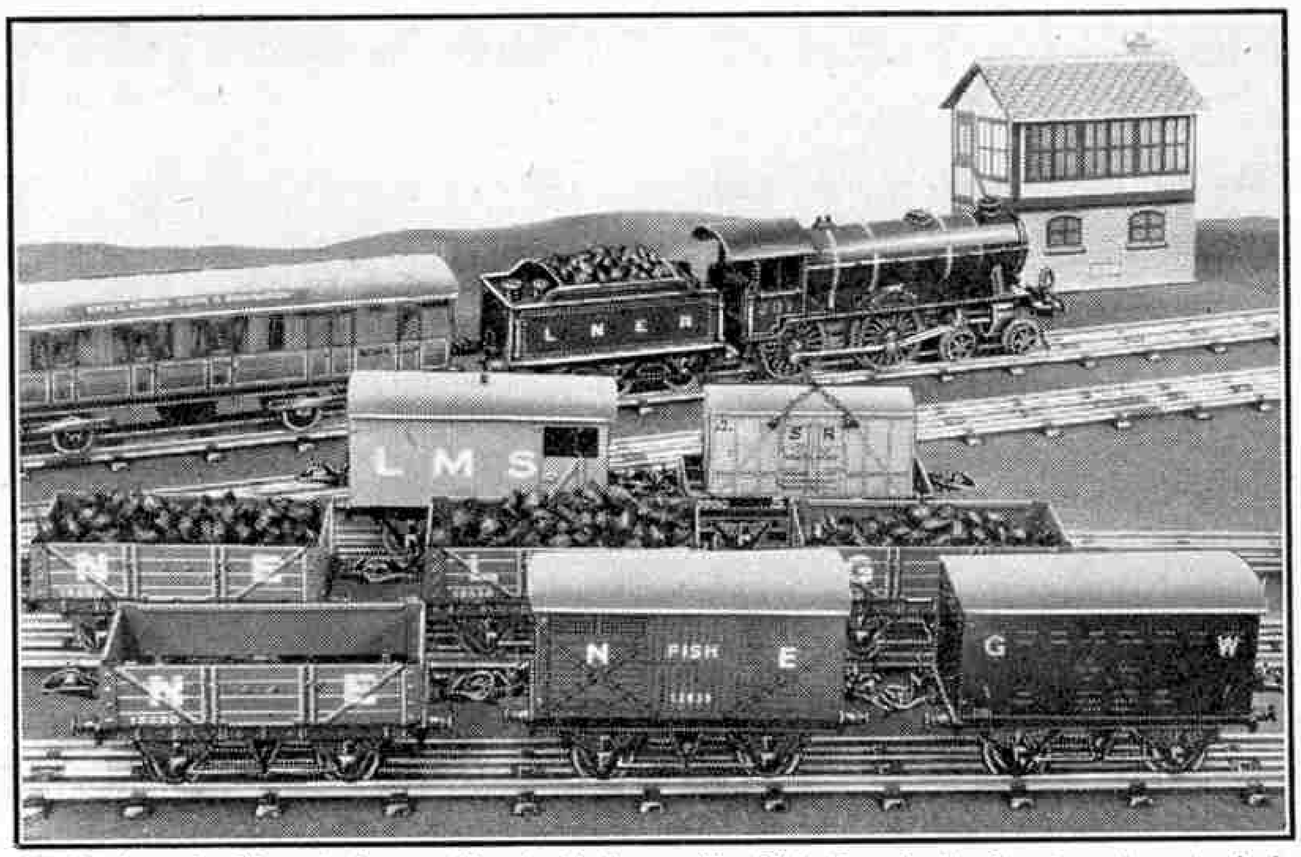
Scenic effects are extended from the lineside to the main roads adjoining the layout, for heavy motor traffic, including almost every type of vehicle available, is run on the roads. This traffic is operated in conjunction with the railway services. The illustration on this page shows the Hornby No. E2E Level Crossing that is used by the road transport vehicles working in connection with the line.

The Use of Hornby Rolling Stock

Passenger and Goods Train Formations

STATION working and locomotive operation have formed the subjects of recent articles in these pages, and this month we deal with the use of Hornby Rolling Stock in order to produce the most realistic effects and the best fun.

The Hornby Series includes a wide variety of vehicles for both passenger and freight traffic. Our trains will not be realistic if we use in their formation as many different types of rolling stock as we can get hold of, however. It is necessary to select our coaches, wagons, vans and so on with a view to the kind of traffic that we operate on our system. In actual practice the classification of the numerous types of stock is very thoroughly carried out, and strict control is exercised over their working, to ensure that each type of vehicle is put to its maximum use in carrying the traffic for which it has been designed. If we adopt similar measures in miniature, greater realism in the formation of our trains and therefore more enjoyment will be the result, but it is scarcely necessary to adhere so strictly to our rolling stock classification and control as is done in real practice.



A selection of rolling stock on a Hornby Railway. The Fish Vans in the foreground are typical examples of the vehicles used on express freight trains conveying perishable traffic.

On a Hornby railway, especially where regular working by timetables is carried out, the operator must know exactly what stock is available for the different services. One of the earliest steps in preparing a working scheme therefore is to make a list of all the coaches, wagons and vans on the system. If these are separated into classes it is possible to see straight away what vehicles are on hand for any particular kind of traffic that is to be worked.

Passenger coaches first demand consideration, and with those of the Hornby Series it is possible to make up trains ranging from luxurious Pullmans down to the ordinary locals. The No. 1 Coaches offer many possibilities for use on local or branch work. They are particularly suitable for working in "sets" composed of, say, three Coaches and a Guard's Van. For longer distance suburban or "residential" services, nothing can be better than the No. 2 Coaches. Excellent reproductions of this type of train can be made by using First-Third Coaches in the centre of the train, with a Brake-Third at each end. On layouts where trains have to be restricted in length, however, a favourite scheme is to place two of the Composite vehicles together to form the train.

For express passenger work the No. 2 Corridor Coaches are ideal. Very realistic trains can be made up, and a similar assembly to that just described for the suburban trains can be used. The Corridor Coaches can be properly gangwayed together by means of the realistic Corridor Connections supplied with them. Valuable accessories that should not be overlooked in connection with these Coaches are the Hornby Train Name Boards. The Coaches are fitted with holders for the boards and a train distinguished by their use always adds greatly to the interest of operations.

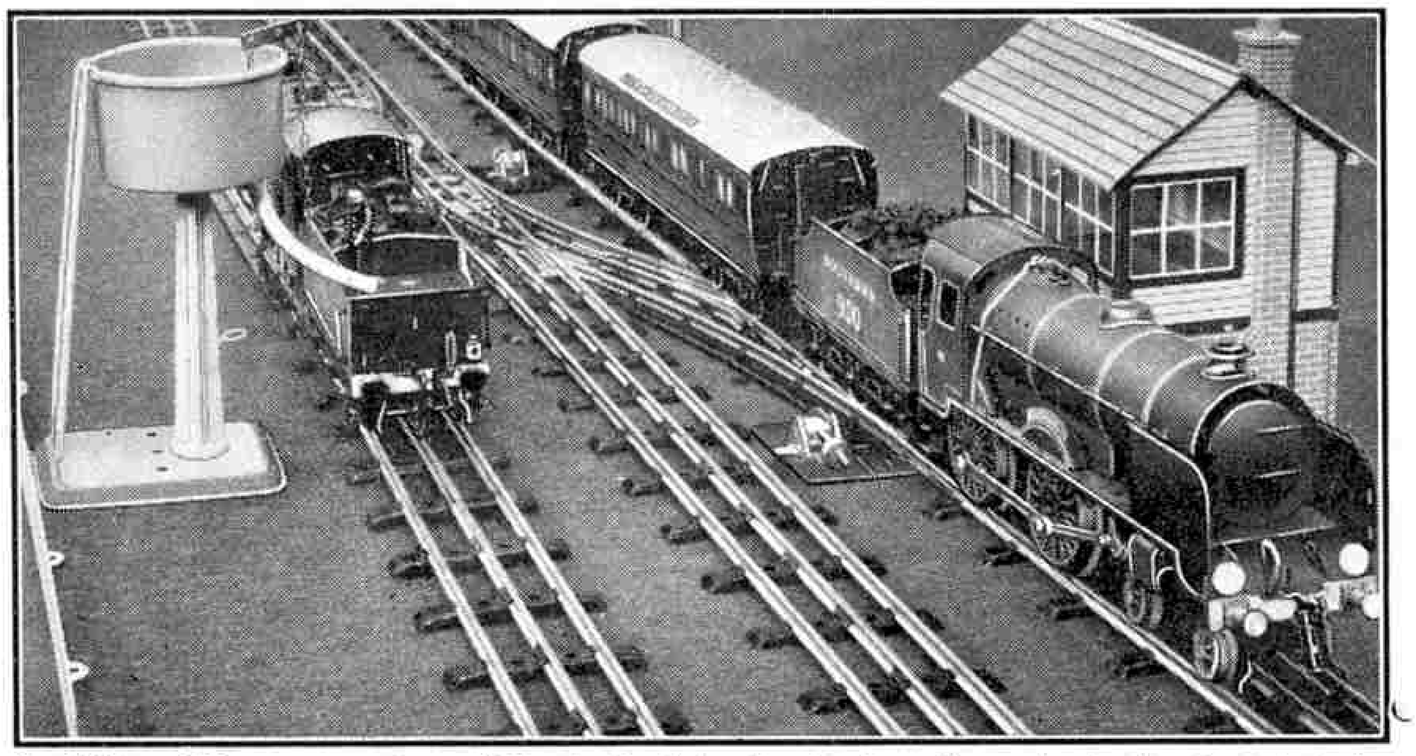
For long distance excursions or specials, such as football, or race trains, the No. 2 Saloon Coaches are excellent. These Coaches follow the end vestibule centre-corridor design, and are very pleasing in appearance.

The most handsome Coaches in the Hornby Series are undoubtedly the No. 2 Special Pullmans, which are available in the form of ordinary Pullman Coaches and also as Composite vehicles with accommodation for the guard and luggage. A characteristic feature of these Coaches is the provision of names as in actual practice. The names of the Hornby Pullman Coaches available are *"Loraine," "Zenobia"* or *"Grosvenor,"* and those of the Composite vehicles are *"Alberta," "Verona"* or *"Montana."* With these splendid models formations for representing famous trains as *"The Golden Arrow," "The Queen of Scots," "The Yorkshire Pullman"* or the *"Bournemouth Belle"* can be made up.

The subject of freight trains now requires attention. The selection of vehicles to compose a fast freight train is of the utmost importance. The fast services of actual practice are only possible as the result of the fitting of much of the stock employed with automatic brakes and other equipment generally corresponding to that of passenger trains. Some of the freight trains in practice are what is known as "fully fitted." They are said to be "piped," which means that they have continuous brake pipes connected throughout the train, and must have brake apparatus provided on at least half the vehicles. As all of them are "piped" their position in the train whether they are brake-fitted or not does not matter. On the other hand "partially fitted" trains are composed of some brake-fitted vehicles and some ordinary stock, and the fitted vehicles of these must be marshalled next to the engine if their brake power is to be effective.

As readers are aware, the freight services in actual

practice are of the utmost importance, especially those dealing with perishables and foodstuffs generally, and the Hornby Series is well supplied with vans for the handling of this type of freight. There are numerous trains that carry fish, meat and fruit and for all of these appropriate vehicles are available in the Hornby Series and with them some very realistic trains can be assembled. The Fish Van is of special interest to L.N.E.R. miniature railway owners, for it represents a type of vehicle used on that line for the transport of fish from the fishing ports to the inland centres of population.



A miniature S.R. express made up of Hornby No. 2 Corridor Coaches. The engine hauling the train is the E420 "Eton" Locomotive, which is a model of the first member of the real "Schools" class.

The kind of meat traffic supposed to be in transit affects the choice of vehicles to use. The popular Hornby Refrigerator Van represents the fully insulated meat van of actual practice, which is fitted with refrigerating apparatus for carrying frozen meat imported from abroad. Except those of the S.R., these vehicles are painted white and a complete train of them is of striking appearance. The S.R. refrigerator van is equally distinctive in its own way, for it is painted the peculiar shade of pink that is preferred by the S.R. for such vehicles. The No. 0 Refrigerator Vans are slightly different in detail but this has no effect on their use in traffic.

For fresh meat traffic the ventilated No. 0 Meat Van is the correct vehicle. This is available representing L.M.S., N.E. or G.W. meat vans, and each is finished in the correct details. Each of these Vans can be used in a realistic manner in the assembly in miniature of such trains as those that run from Scotland and from the West country direct to city terminals. Another van of similar construction is the L.M.S. No. 0 Banana Van, which represents the special steam-heated type of vehicle operating from Garston Dock. This interesting vehicle is finished in grey with white lettering.



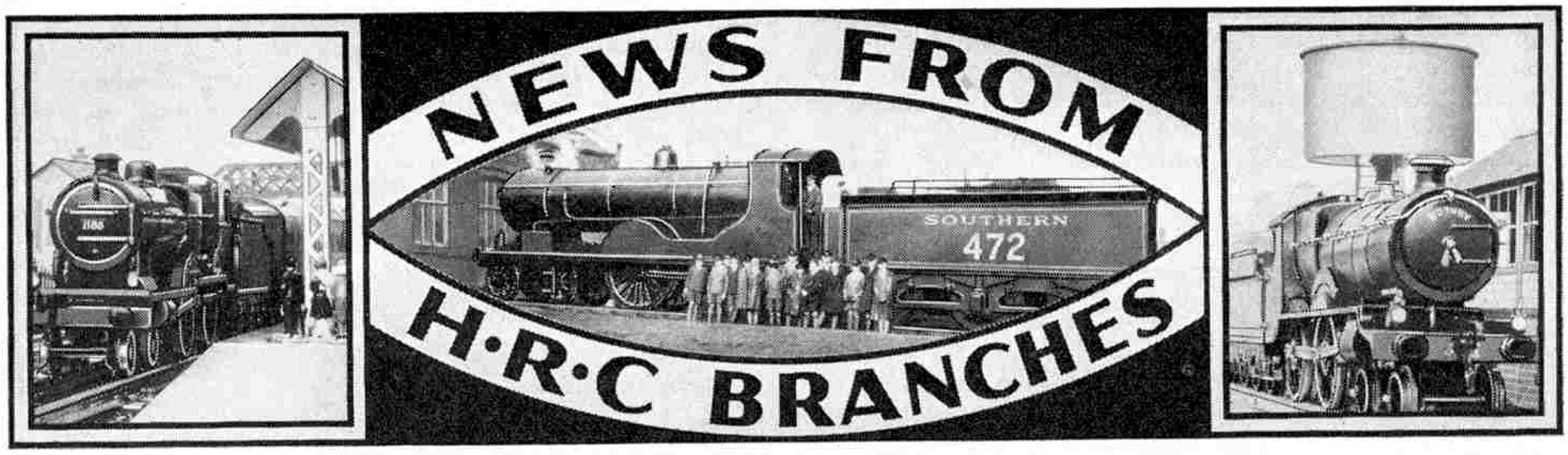
Up and down expresses passing each other on a Hornby S.R. layout. A Train Name Board is prominent on the roof of the Coach in the background and adds considerably to the "real" effect.

For the conveyance of milk there is the G.W.R. Milk Traffic Van, a most realistic vehicle, being finished in the "coach brown" of the G.W.R., which is applied to milk vans, parcel vans and other similar vehicles. In addition there is the very handsome Hornby Milk Tank Wagon. An increasing amount of milk is conveyed in Tank Wagons to-day, and these tanks are worked over all four groups, so that Hornby Railway owners can make correct use of them on their own layouts, whatever real railways these represent. They are instantly recognisable by their white colouring, and in this and in other details the Hornby vehicle is a close reproduction of the real thing. All these vehicles can be classed as "piped," and are therefore suitable for express goods trains. In general, all vans can be imagined to be so fitted, for their purposes necessarily make them suitable for fast freight work, and occasionally, for conveyance coupled on to the front or rear of passenger trains.

The introduction in 1936 of Containers in the Hornby Series added greatly to the fun of operating goods services. Containers are similar to the body of a railway van or wagon, and can be carried on a suitable rail vehicle or on a road lorry as required. They have earned for themselves the appropriate title of "the suitcases of commerce." For their transport in miniature the Hornby Flat Truck is ideal and is in accordance with the latest practice on the actual railways, for a feature of the introduction of the container services was the provision of special flat trucks for their conveyance. The Hornby miniature containers are fitted with lifting tackle on the roof in the form of chains and a ring for the crane hooks, and look very effective when loaded on to the trucks, as can be seen from the one visible in the illustration on the opposite page. When making up trains using these vehicles, it should be remembered that in actual practice only a certain number of flat trucks are pipe-fitted. All those that carry containers are, but as the Hornby traffic manager has only one type of Flat Truck, it is a good idea to mark the wagons in some way so as to differentiate between "piped" and ordinary vehicles.

An "X" could be painted on each side, signifying "Suitable for express traffic." This is a scheme that is applied in actual practice. The same plan can be followed with such vehicles as the No. 1 Luggage Vans, which represent the type of van that may appear as part of an express goods train, or in the composition of an ordinary freighter. The individual Hornby railway owner can decide whether his luggage vans are to be considered as "piped" or not according to the kind of trains on which they are most commonly run.

On the other hand a No. 2 Luggage Van, which represents a high capacity type of van in general freight, or the "general utility" and parcels van that is now so popular, will necessarily be a brake-fitted vehicle. As a rule open wagons are not "pipe fitted."



Branch News

CHORLTON-CUM-HARDY.—Points and signals on the Branch layout have been interlocked, and a new system of timetable working introduced. Two Pullman Coaches have been converted into an articulated unit. A quayside scene has been added to the layout, and gives realism to the running of *"The Irish Mail"* and the *"Ocean Liner Express."* Other well-known trains run are *"The Mancunian"* and the *"Queen of Scots Pullman."* A Social Evening was greatly enjoyed. Secretary: G. H. Hill, 56, Highfield Road, Chorlton-cum-Hardy, Manchester 21.

LOUGHTON. — Following incorporation, meetings have been occupied in making up the Branch layout. The track has been laid down, and signals and various buildings added, and a successful start has been made with actual train running. Secretary: G. W. Ruffell, 10, Elmhurst Way, Avondale Drive, Loughton, Essex.

TWYFORD GROVE.—Coach building has been continued. On the Branch layout a hump marshalling yard has been laid down at the "Plymouth" goods yard, and two carriage sheds 7 ft. long have been placed in position. A Hornby No. 1 Special Tank has been added to the locomotive stud. A visit has been paid to London. Secretary: J. W. Prescott, 6, Twyford Grove, Banbury.

MAIDSTONE.—Satisfactory progress was reported at the Annual General Meeting of the Branch. A 10-in. garden railway of a local enthusiast was inspected with interest. The club has had on loan a multi-gauge track for passenger-carrying locomotives. Several models constructed by members were displayed at the Model Engineering Exhibition in London. The future programme includes Cinematograph Shows and Lantern Lectures. Secretary: J. Elbourn, 91, Old Tovil Road, Maidstone.

DENVILLE.—Meetings have been well attended, and much work has been done in connection with the Branch layout, which is being relaid to a new design. Electric equipment is used throughout. It is intended to construct an embankment for the layout, using a framework of Meccano and a covering of papier mache. A Hornby *"Eton"* Locomotive has been purchased. Games are played regularly. Secretary: L. Adkin, "Myrtle Cottage," Fourth Avenue, Denville, Havant, Hampshire.

BURY ST. EDMUNDS.—The attractive programme followed has included talks of railway and general interest, games and competitions, frequent discussions on Branch activities, and track work. Excellent timetable operations have been conducted, interest being increased by the addition of a Hornby *"Flying Scotsman"* Locomotive and a new corridor coach. A visit has been arranged to Haughley Junction, where it is hoped to see the *"East Anglian"* Express, and also to Thetford. The first Exhibition of the Branch was a great success, and is to be repeated annually. Secretary: T. S. West, 10, Crown Street, Bury St. Edmunds.

EVERGLADES.—Realistic operations have been carried out on the fine electric layout of the Branch. *"The Royal Scot"* is one of many famous expresses realistically reproduced. It is hauled by a Hornby *"Princess Elizabeth"* Locomotive, and the layout on which it runs is of Hornby Steel Track. Heavy goods traffic has been dealt with on the tinplate layout, a Hornby E120 Tank doing good work in the shunting yards. Darts and billiards have been played. A visit is to be paid to a signal cabin. Secretary: P. D. Stuart, 7, Lodge Avenue, Cosham, Hants.

QUEEN ELIZABETH'S GRAMMAR SCHOOL (WIMBORNE).—Timetable working has been carried out and schedules have been well maintained. The running of mixed trains has proved interesting, milk vans being regularly attached to local passenger trains. It is intended to take photographs of the Branch and the layout, the developing and printing to be done by members. Secretary: D. W. James, The Grammar School, Wimborne, Dorset.

NORWOOD.—Intensive train running has been possible with the very useful Branch stud of 11 locomotives. Members visited the extensive joint L.M.S. and L.N.E.R. model line of Mr. J. B. Wilson, of West Norwood, and were particularly interested in the scale coaches he has built. Plans have been prepared for the building of similar coaches for Branch use. A locomotive and carriage repair depot, equipped with travelling cranes, has been constructed in Meccano. Secretary: A. Sippett, 5, Moreton House, Garrett Lane, Lower Tooting, London S.W.17.

NORTHAMPTON.—The new track constructed during the summer is now in use, and regular timetable working has been carried out. The layout has four main line stations and a branch terminus, so that long-distance expresses can be run. Secretary: D. J. Rushton, 40, The Vale, Northampton.



A group of members of the Edgbaston Branch No. 347, Chairman, Mr. L. A. Strudwick, who is seated in the centre of the group of members shown, secretary, R. L. Teare. The Branch was incorporated in April 1938. Meetings are held weekly and track operations, with timetable passenger and goods working, are the chief feature of the programme. Debates are held and visits made to engine sheds and other places of railway interest.

Proposed Branches

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below.

HOUNSLOW—A. E. Foot, 5, Linden Avenue.
LIVERPOOL 22—L. Crump, 16, Great Georges Road, Waterloo.
LOUGHTON—Mr. G. A. Ford, 8, Forest View Road, Loughton, Essex.
SCUNTHORPE—M. Ward, 13, Clarke Street.
WALSALL—Mr. G. J. Wilkes, "The Elms," Bescot Road.
WOLVERHAMPTON—F. C. Spink, 336, Stafford Road, Oxley.

Branches Recently Incorporated

360. LOUGHTON—Mr. E. T. Driver, "St. Margaret's," Tycehurst Hill, Loughton, Essex.
361. WELLINGTON WEST—Mr. T. Cassells, 26, Sugarloaf Road, Brooklyn, Wellington, New Zealand.
362. "FIRST" NORWICH—Mr. W. J. Green, 82, Eade Road, Norwich.
363. ILFORD—Mr. A. W. Kent, 183, Balfour Road, Ilford, Essex.
364. HOMELEA (NEW MALDEN)—Mr. J. H. Cocks, 14, Hillbrow, New Malden.

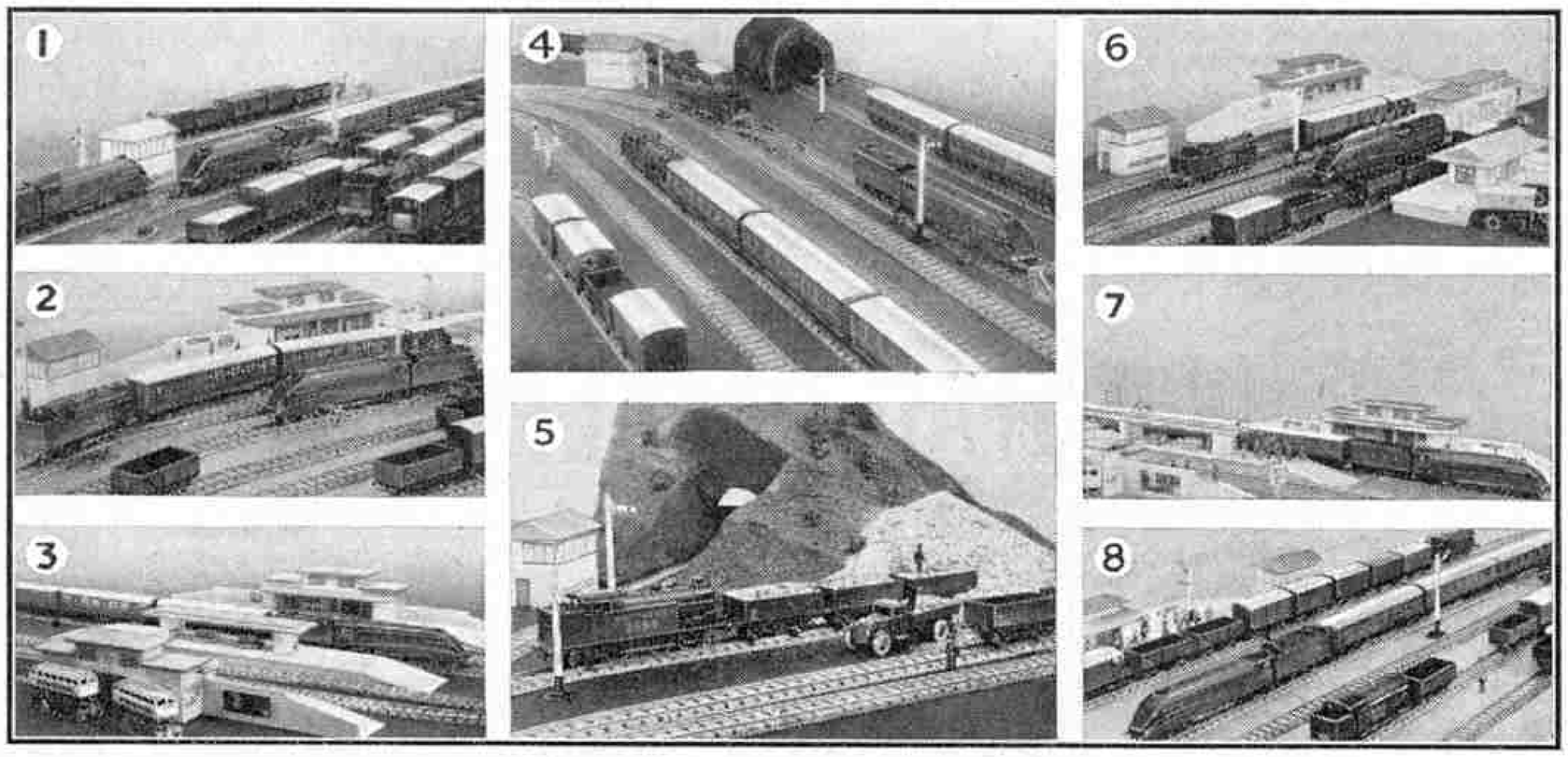
Join the Hornby Railway Company and become eligible for the competitions announced on this page.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

MODEL RAILWAY VOTING CONTEST

The eight photographs reproduced on this page show interesting views of Hornby-Dublo railways. Some of them concentrate attention on the locomotive or train, their principal feature being interesting formation or working; in others lineside arrangements and effects are more prominent, and these combine with the trains to form strikingly realistic scenes. For our chief contest this month, we ask members to place the photographs in order of attractiveness according to their own ideas on the building up of miniature railway layouts.



In this contest each competitor is asked to do only two things. The first is to say which illustration he considers the most attractive, and to give in a few words his reason for selecting it. The second is to write down a list of the photographs in the order in which he thinks they will be placed by the votes of the competitors, representing each one by the number shown on it. His own first choice need not necessarily be placed at the head of the list.

There will be two sections, Home and Overseas, and in each prizes of products of Meccano Ltd., to the respective values of 21/–, 15/– and 10/6 will be awarded to the three competitors in whose entries the order in which the photographs are placed is nearest to that in the list compiled by taking the votes in all the entries into account. In the event of a tie for any prize, the award will be made to the competitor who gives the best statement of his reasons for his choice of the photograph that he considers best.

Envelopes containing entries must be marked *"H.R.C. February Voting Contest"* in the top left-hand corner, and each sheet submitted must have on the back the name, full postal address and H.R.C. membership number. Entries in the Home section must be posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 28th February. The Overseas closing date is 31st May.

Drawing Contest

We have pleasure in announcing this month the second of this year's Drawing Contests. Competitions of this kind are always popular for every railway enthusiast enjoys making drawings of railway scenes, such as his favourite locomotive, a train at speed or a station scene. The subject we have chosen for our competition this month is "A Signalman at Work." Competitors may illustrate any of the duties of a signalman, and need not restrict their attempts to the most common operation, that of "pulling the levers."

To the senders of the three best drawings received in each Section, Home and Overseas, prizes will be awarded consisting of Hornby Train or Meccano goods to the value of 21/–, 15/– and 10/6 respectively. The sender's name, full postal address and H.R.C. membership number must be written on the back of each entry.

Envelopes containing entries must be clearly marked *"H.R.C. February Drawing Contest"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 28th February. The closing date for the Overseas Section is 31st May.

Layout Planning Contest

In this contest we are asking members to submit designs for layouts based on a main-line oval, of either double or single track. Two terminal stations, sidings and any other features necessary to make a model railway for passenger and goods traffic practicable and interesting may be added, but the maximum space allowed is 15 ft. long and 10 ft. wide. No cost restrictions are imposed, but the layout must be one that can be constructed from the Standard Hornby Tinplate Track.

The contest will be divided into the usual two sections, Home and Overseas, and in each will be awarded prizes consisting of any products manufactured by Meccano Ltd., to the values of 21/–, 15/– and 10/6. There will also be a number of Consolation prizes. Entries must be addressed *"H.R.C. February Layout Planning Contest,"* Meccano Ltd., Binns Road, Liverpool 13, and the closing dates in the Home and Overseas Sections are 28th February and 31st May, respectively. Each competitor's name, full postal address and H.R.C. membership number must be written on the back of his entry.

COMPETITION RESULTS

HOME

November "Word Building Contest."—First: H. G. Johnson (38784), Southall, Middlesex. Second: D. O'Herlihy (60656), Dalkey, Co. Dublin. Third: H. Kershaw (60754), Darwen, Lancs. Consolation Prizes: R. Richardson (62755), Bridlington, E. Yorks.; J. Brown (58364), Drumchapel, Glasgow; C. E. Wrayford (6039), Bovey Tracey, Devon; R. S. Bayly (52870), Wembley, Middlesex; K. E. Milburn (26029), Chingford, London E.4; I. Harris (60992), London W.6.

November "Missing Links Contest."—First: J. C. Button (10335), Crewe, Cheshire. Second: D. H. Earle (41617), Wembley Park, Middlesex. Third: C. E. Wrayford (6039), Bovey Tracey, Devon. Consolation Prizes: P. D. Stuart (59000), Cosham, Hants.; H. Johnston (38784), Southall, Middlesex; M. Searight (46773), Blackrock, Co. Dublin, Eire; F. Mills (31), Kearsley, Nr. Bolton; W. Scott-Crosse (34990), Northampton; D. H. Wakely (17486), Cheam, Surrey.

OVERSEAS

August "Photo Contest No. 5."—First: T. Watson (18065), New South Wales, Australia. Second: G. C. Taylor (59265), New South Wales, Australia. Third: H. Bennett (10615), Auckland, New Zealand. Consolation Prizes: R. Pearson (29199), Victoria, Australia; J. S. B. Taylor (60262), Johannesburg, South Africa; P. Macdonald (43305), Toronto, Ontario, Canada; A. A. H. Gillisfen (54756), Wijk-Maastricht, Holland.

August "Spot The Errors Contest No. 1."—First: D. Parker (38595), Ontario, Canada. Second: H. H. Milligan (53976), Capetown, South Africa. Third: A. A. Shawky (53749), Giza, Orman, Egypt. Consolation Prizes: R. Pearson (29199), Victoria, Australia; J. Ridgway (51742), Johannesburg, South Africa; D. Murison (37642), Buenos Aires, South America.

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STAMP COLLECTING

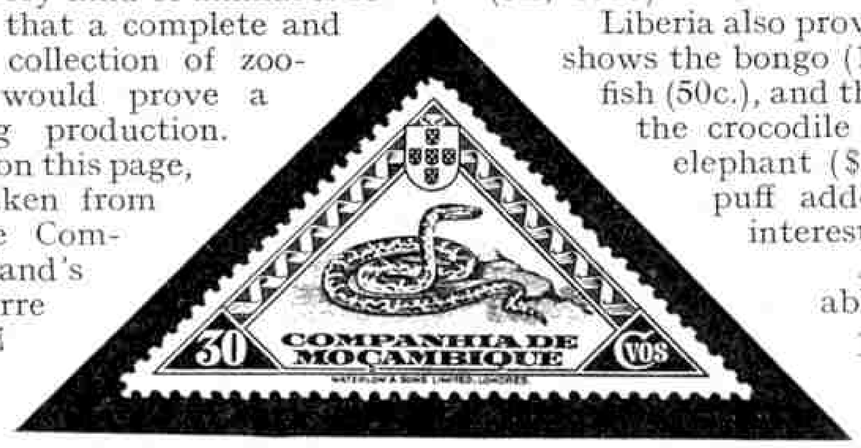
A STAMP ZOO

By D. W. Tucker

MANY different types of subject collections have been dealt with in past issues of the "*M.M.*" Readers have been shown how to form collections of ships, railway locomotives, wireless stations and bridges, for example. We are sure, however, that many stamp collectors have a taste for natural history, and to these we say, "Why not build a Zoological Collection?"



There are literally hundreds of different stamp portraits of animals, birds, fishes, reptiles and insects, ranging from the majestic elephants of Africa and India to the silkworms of Lebanon! Indeed almost every kind of animal is so well represented that a complete and well written-up collection of zoological stamps would prove a most fascinating production. The illustrations on this page, four of them taken from the Mozambique Company's May 1937 issue, one from Greenland's recent first issue, and the other from St. Pierre and Miquelon's new issue, give a splendid idea of the type and great interest of the material that is available.



The range of material is wide and it is therefore important to decide upon a definite scheme of arrangement at the outset. Otherwise the collection is likely to develop into a jumble. There are various ways in which the collection may be arranged satisfactorily, of course, and the following suggestions are offered only as guides for those who have no special ideas of their own.

The stamps may be arranged to follow the usual classification of animals, or in accordance with the countries or geographical regions from which they come. The arrangement of the stamps by geographical regions is the easier way, and has the advantage that it presents an immediate picture of the animal population of various parts of the world. The Mozambique Company's 1937 issue, to which we have already referred, gives, for example, a splendid impression of the animals of East Africa. In addition to the giraffe, zebra, lion and python, illustrated here, this set includes hippopotami (80c.), the white rhinoceros (40c.), kudu antelope (2 esc.), crocodile (50c.), and leopard (60c.).





Arrangement by classes is more in accordance with zoological principles, of course, and in this a handbook, such as "*The Stamp Zoo*," published by Stanley Gibbons Ltd. in two parts at 1/– each, would prove a valuable aid.

In a grouping arrangement of the stamps, all birds must be brought together, then reptiles, fish, insects and mammals in turn. Mammals will have to be sub-divided into classes, such as ruminants, horned and hornless, hoofed animals, carnivora, and rodents. Elephants, in many respects the most interesting of all land animals, should be given a separate group of their own. The Mozambique stamps already mentioned will provide the starting point for several of these groups. Other countries from which a wide range of material can be obtained are the Italian Colonies. For example, the stamps of Ethiopia show the gazelle (3L 70, 1938), and Bateleur eagle (1L, 1938). Those of Somaliland picture the ostrich (5L, 1932), and hippopotamus (10L, 1932), and on those of Tripoli are the gazelle (10L, 1932), lioness (1L 75, 1932), golden eagle (1L 25, 1933) and leopard (5L, 1933).



Liberia also provides a wide range of material. The 1918 issue shows the bongo (1c.), the palm civet (2c.), the curious bommi fish (50c.), and the crowned eagle (30c.). The 1921 issue shows the crocodile (15c.), leopard (25c.), a hornbill ($2) and elephant ($5). The registration stamp of 1921 shows a puff adder. The 1906 issue also provides several interesting specimens.

Among British issues, North Borneo probably will prove the most helpful. An argus pheasant is shown on the 5c. of 1894, and other animals represented are the crocodile (12c., 1894), orang-outang (4c., 1897), and honey bear (10c., 1897). The 1909 issue shows the tapir (1c.), elephant (5c.), rhinoceros (6c.), wild boar (10c.), cockatoo (12c.), hornbill (16c.), wild bull (18c.) and megapod (24c.). A clouded leopard is shown on the 25c. issue of 1931.

It is impossible in a small space to give a complete list of stamps that might be featured in the collection advantageously, but the Editor has such a list in preparation, and copies will be available later on for distribution among readers who are interested.

A loose-leaf album in which to mount the collection is essential. The most suitable size would be about 9½ in. by 11¼ in., and it should be made the general rule not to have more than 15 or 16 stamps to a page, for a greater number would make the page appear a confused mass of stamps and writing. This must be avoided at all costs as the stamp designs are to be considered individually.

In the writing-up, the minimum requirements are the name of the animal, and the country of origin, but if desired the scientific name, habitat, range, habits and any other details may be added. All this matter should be "composed" on a piece of paper before it is finally written on the album page.

The style of writing-up depends on the collector's choice and ability. A simple style and plain lettering, black on a white page, or white on a black one, always looks effective.



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Fine packet of unused African stamps from Belgian Congo (river scene), Morocco Agencies King Geo. VI, already obsolete, Italian East Africa (Abyssinia, etc.), Sudan, Somali Coast, Kenya, Cameroons, a fine set of 5 Ivory Coast, new issue, inscribed in error 'Baloue Woman' for 'Baoule Woman'—one is already obsolete—and another set, only just issued, of French Guinea, Mozambique, etc. etc., 30 stamps in all, sent free to all genuine applicants for approvals enclosing 2d. postage. Only one gift to each applicant.
R. D. HARRISON — ROYDON — WARE

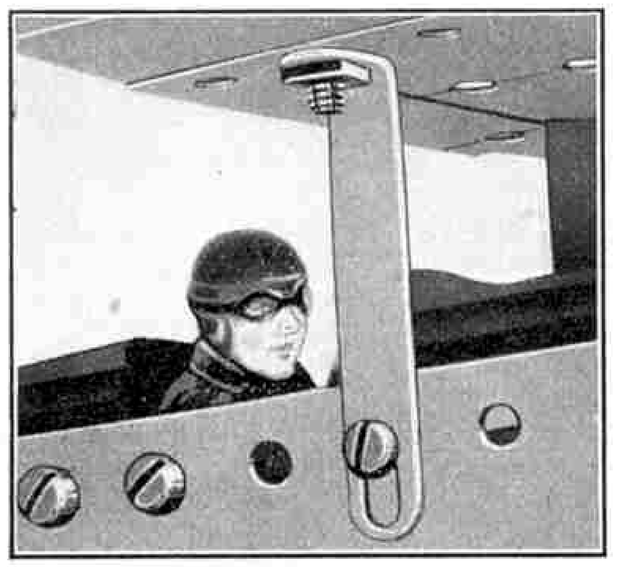
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H. C. WATKINS (M. DEPT.), GRANVILLE ROAD, BARNET.

UNUSED 1/- GREAT BRITAIN 1864
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Collection 40 Nigeria, Rhodesia, etc., cat. 27/-, for 5/6.
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50 Diff. Airmails ... ... 3/- 500 Diff. Stamps 2/6
Post extra. Subject to being in stock.
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Part No. P100 (illustrated above) is used in Nos. 1, 2, 1 Special and 2 Special Outfit models. The Pilot is fixed to a double single bracket ready for bolting to the sides of the fuselage.

Prices:
P99 Aeroplane Pilot ... ... each 4d.
P100 „ „ ... ... „ 4d.

Meccano Ltd., Binns Road, Liverpool 13

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Readers are urged to observe the following points when writing to advertisers:

1. **Mention the "M.M." and any special reference number quoted in the advertisement. This helps the advertisers to give prompt attention.**
2. **See that the full amount of the price and any postage is included. It is unfair to expect advertisers to fulfil their undertakings promptly if short remittances are sent.**
3. **GIVE YOUR FULL ADDRESS.**

THE ADVERTISEMENT MANAGER
MECCANO MAGAZINE, Binns Rd., LIVERPOOL 13



Stamp Gossip

and Notes on New Issues



The Winter Charity Issues

Year by year the number of countries issuing charity stamps at Christmas grows bigger and bigger, and such issues arouse great interest among the general public, as well as among stamp collectors. This month's new issues are drawn entirely from charity stamps, no less than six countries being represented.



Taking the countries in alphabetical order, the Danzig Free State has issued five stamps each bearing a premium for winter relief funds. In view of the interesting history of Danzig as a port, it is not surprising that each of the designs has a nautical flavour. Our illustration is of the 5pf value, which shows the sailing yacht *"Peter von Danzig."* This design appears also on the 40pf value. The other designs are: 10pf, dredger *"Fu Ching"*; 15pf, steamship *"Columbus"*; 25pf, steamship *"Hansestadt Danzig."*

Germany has issued nine stamps, also for winter relief funds, with designs drawn almost entirely from famous Austrian beauty spots. A charming feature is the incorporation of popular Alpine flowers in each of the designs. We have chosen the 6pf value for illustration. This shows the Grossglockner (12,461 ft.) the highest mountain in the German Reich. The flower is the famous star-shaped edelweiss which, it is pleasing to know, is now strictly protected throughout Germany.

The remaining designs are as follows: 3pf, Schloss Forchtenstein, a 14th century castle in Burgenland; flower, the silvery dwarf thistle. 4pf, avalanche galleries on the Flexen Road near Bregenz; the spring anemone. 5pf, view at Zell am See, the famous Austrian sports centre; auricula. 8pf, the Wachau Valley on the 12pf, the bronze equestrian statue of Prince Eugene of Savoy in the Helden Platz, Vienna; dog rose, not strictly an Alpine plant. 15pf, the famous mountain of iron, the Erzberg in Steiermark; the hairy alpine rose, which is not a rose at all, but a species of rhododendron. 25pf, Hall, a famous salt-mining town in the Tyrol; the Town Hall shown in the design dates from the 15th century; stemless gentian. 40pf, Braunau, the birthplace of Herr Hitler; Spring crocus.



The Dutch Indies series of five stamps was issued for Child Welfare Charities, and each of the stamps shows a child patient under treatment. We illustrate the 3½c value, which shows a nurse bandaging a boy's head. The other designs are similar but show different types of injuries; 2c, hand; 7½c, arm; 20c, head. The 10c shows a patient being washed.

The Luxemburg set, issued for general charitable purposes, consisted of six values each using the design shown here, a portrait of Duke Sigismond who ruled from 1419 to 1437.

Monaco devoted its Christmas appeal to Anti-cancer Funds and issued two stamps, the 65c value illustrated here, showing portraits of Pierre and Marie Curie, discoverers of radium, and a 1f 75c value showing a view in Monaco.

Last and most interesting of all is the Swiss Pro Juventute issue, the pioneer of Christmas charity stamps, which first appeared in 1913 and has been issued regularly since 1915. This year's designs show a portrait of Salomon Gessner, an 18th century poet, on the 5c value, and types of Swiss girlhood in Cantonal costumes on the remaining designs, as follows: 10c, girl from St. Gallen; 20c (illustrated) Uri; 30c, Aargau.

Greenland's First Issue

Another new name appeared in the stamp world on 1st December when Greenland, Denmark's possession in the Arctic, made its first stamp issue. The series consists of seven stamps sharing two designs, a portrait of King Christian X of Denmark on the five lower values, and on the two higher values a picture of a polar bear on an ice floe, an illustration of which appears on page 127 of this issue.

* * * *

The new series for St. Pierre and Miquelon, the French island possessions off the coast of Newfoundland, provide four interesting new designs, one of which, showing a dog team, is illustrated on page 127. This design is used for the eight low values, 2c to 25c. The full series consists of 22 stamps and the remaining designs are as follows: 30c to 65c (five values), view of St. Pierre Harbour; 80c to 1f 75 (four values), Tortoise Lighthouse; 2f to 20f (five values), a rock coast scene.

* * * *

The New Zealand Postmaster General has announced that the Dominion's Centennial Celebrations in 1940 will be commemorated by a special series of stamps bearing designs illustrating the Dominion's industrial and historical development.

The Whitfield King 1939 Price List

The 1939 edition of Messrs. Whitfield King and Company's annual price list of sets and packets is now available. It contains 180 pages, and gives details of more than 6,000 sets and packets of stamps. The contents of these cover every country in the world, as well as many of the specialist subjects to which we have given attention in these pages from time to time. From these facts readers will realise the value of the list and its helpfulness to every stamp collector, young or old. Every one of our readers will find something in this list that can be added advantageously to his collection.





For example, readers who are interested in our article this month on a "Stamp Zoo" will find on page 17 of the list a Natural History packet of 50 bird and animal stamps, price 6/–.

Messrs. Whitfield King and Company, Ipswich, will be glad to send a copy of this list free of charge to any *"M.M."* reader who is interested. Readers are asked specially to mention the *"M.M."* when writing.

A Correction

An unfortunate error in the setting of Mr. T. Calthorpe's advertisement in our December issue made it seem that our advertiser was offering a packet of 50 Seychelles Stamps for 4/–, a truly amazing bargain that many readers attempted to snap up!

The wording in the two preceding lines should be read as leading to the word "Seychelles," so that the offer actually consists of "50 Zoological Stamps—Camels, Dragons, Parrots, Lions, Elephants, etc., including Gambia, Bechuanaland, Liberia, Basutoland, Seychelles, catalogued to 2/6 each," a very different proposition, although still outstandingly good value.

The error arose from a last-minute adjustment of the advertisement, and we desire it to be clearly known that Mr. Calthorpe was in no way to blame for the misleading setting of the words.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

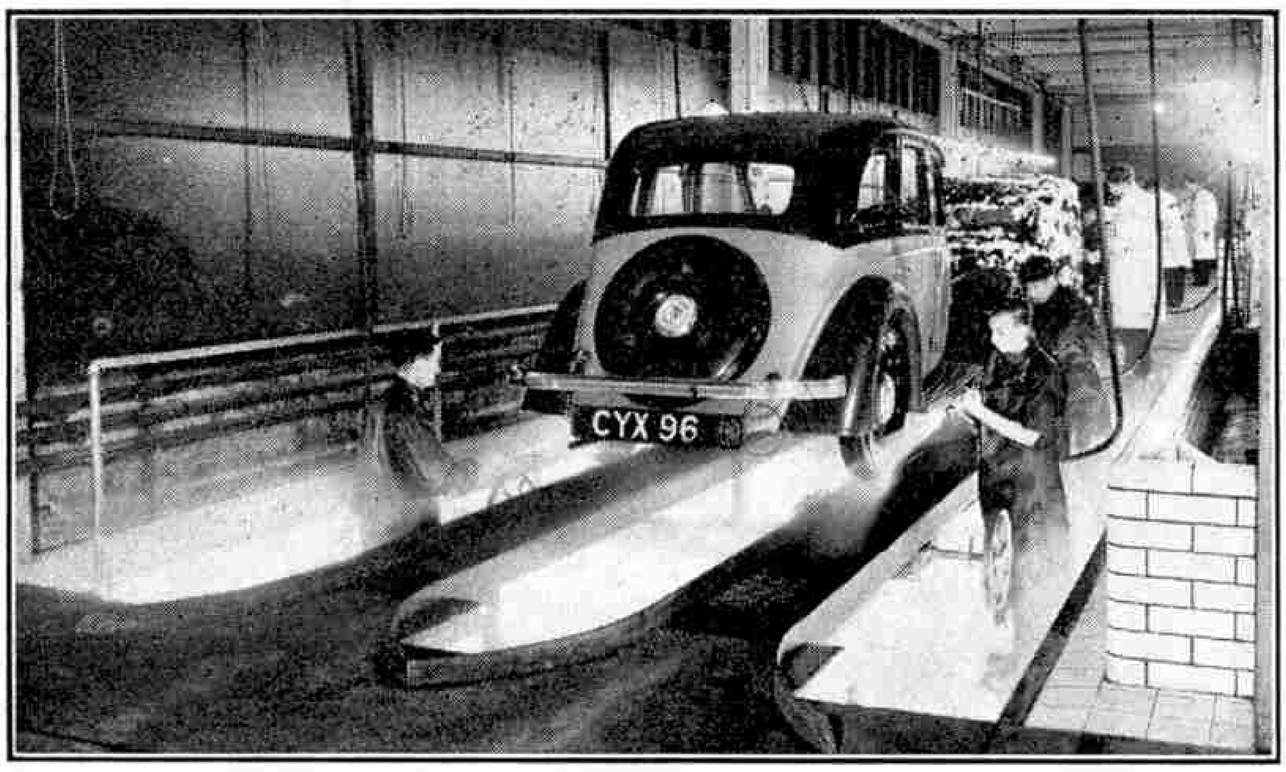
Motor Cars Cleaned in Twenty Minutes

A Conveyor Plant for Speedy Dirt Removal

By T. R. Robinson

THE cleaning of motor cars on a conveyor of a type very similar to those used for assembling them is the latest method of thoroughly removing dirt and grime. The principle adopted is to move the cars slowly past a series of groups of plant, each of which is designed to carry out a particular stage of the removal of dirt and subsequent polishing. An installation of this kind, including a special "soap-foam" wash as part of the cleaning process, is in use at the service station of South London Motors Ltd., Streatham, London S.W., and it was at this plant that the photographs illustrating the present article were taken.

The cars, which come in straight off the road, are first lined up at the entry end of the conveyor line, and as they are moved forward in turn for attention, special floor ramps align them and bring them on to skeleton tracks, which are some two feet above the floor level of the pits in which the operators stand. This level was chosen in order to permit of easy and rapid operation of the water sprays, and to make all parts that are likely to harbour dirt accessible for inspection and cleansing.



A car on the first stage of the 20-minute washing conveyor. The wheels are being cleaned by water sprayed on them under pressure, and the floodlighted pits and quick action jacks can be seen.

As soon as each car is positioned on the ramps, two quick-action jacks lift all four wheels at once, and so permit them to be revolved and cleaned. While this first stage of the work is being dealt with the car is stationary, and four operators, one for each wheel and wing, remove the mud and dirt with water-guns supplied through hoses with water at a pressure of 300 lb. per sq. in. Special quickly-adjustable nozzles on these guns permit various forms of jet to be used by simply turning a finger ring, and the water spray can be continually adjusted to suit the needs of the parts being dealt with. For instance, large under surfaces of wings can be washed with a diffused spray, while axles and other parts can be treated by a concentrated jet.



The snowstorm effect on this car is produced by spraying soap foam all over the bodywork in order to loosen grease and dirt.

As this part of the cleansing is completed, each car is attached in turn to an endless conveyor chain that moves forward continuously in a groove in the floor. The coupling of the car to the chain is by a short length of steel wire rope with hooks at its ends, one hook being attached to the car chassis, and the other engaged with any convenient link of the chain.

The car then creeps forward slowly, and passes under a six-jet shower-bath, while men armed with special long handled brushes wash off dirt from the roof. At the same time others provided with water jets and sponges wash the body panels and upper surfaces of the wings.

The slow movement of the car next brings it to the most interesting part of the process. Special hoses are trained on the car from opposite sides, and a spray of soapy lather, forced out under pressure, is coated all over the bodies, wings, and other surfaces. In a few moments the car looks for all the world as if it had been out in a really severe snowstorm. The action of this soap spray is to loosen and remove from the polished surfaces all the greasy dirt and the film left by the atmosphere and the exhaust fumes of road traffic.

When the car is thoroughly coated, operators with sponges clean it down, working the lather evenly over the panelling and helping it in its work of washing off the dirt. Then the soap and dirt are rinsed off together in a complete wash-down with clean water.

The next process is to dry the body thoroughly by means of leathers and to remove by jets of compressed air all water that may remain in crevices and beading. Alongside the conveyor at this point is a mechanical washing machine, which cleanses the leathers and maintains a continuous supply for the operators.

While the outside of the car is being dried, the inside also is receiving attention from another group of men who clean the upholstery and carpets with a powerful vacuum cleaner, and polish the windows and internal fittings.

Next comes the polishing. Compressed-air sprays are used to produce a fine even mist of polish all over the body and wing surfaces, and then electrically operated mops of lambs-wool get to work to give the car a high gloss. The mops are so designed that they can reach such difficult points as those between the bonnet and wings and around the door handles and to complete the work a final polish is given by hand.

By this time the car is nearing the end of the conveyor chain, and the next stage is a critical inspection, to see that all points have been attended to. If all is as it should be, the car is uncoupled from the chain and driven down to a bay where it awaits its owner. The whole process, from the entry of the car on to the conveyor to the completion of the inspection, usually takes about twenty minutes, which represents a considerable saving of time when compared with the older method of washing.

The mechanism used in connection with the conveyor is interesting. The chain itself is driven by a small electric motor through reduction gearing, and a number of alternative sprockets are provided on the driving unit, so that the speed of the chain can be varied if necessary. Compressed air is supplied by a large motor-driven compressor, and other pumps of the reciprocating type are used to provide the water jets.

The contrast between the appearance of a car when it enters the conveyor and when it leaves is very striking, and shows how completely the vehicle is cleansed from all dirt. The process is so interesting to watch that many owners follow their cars along the whole way.

Competition Corner

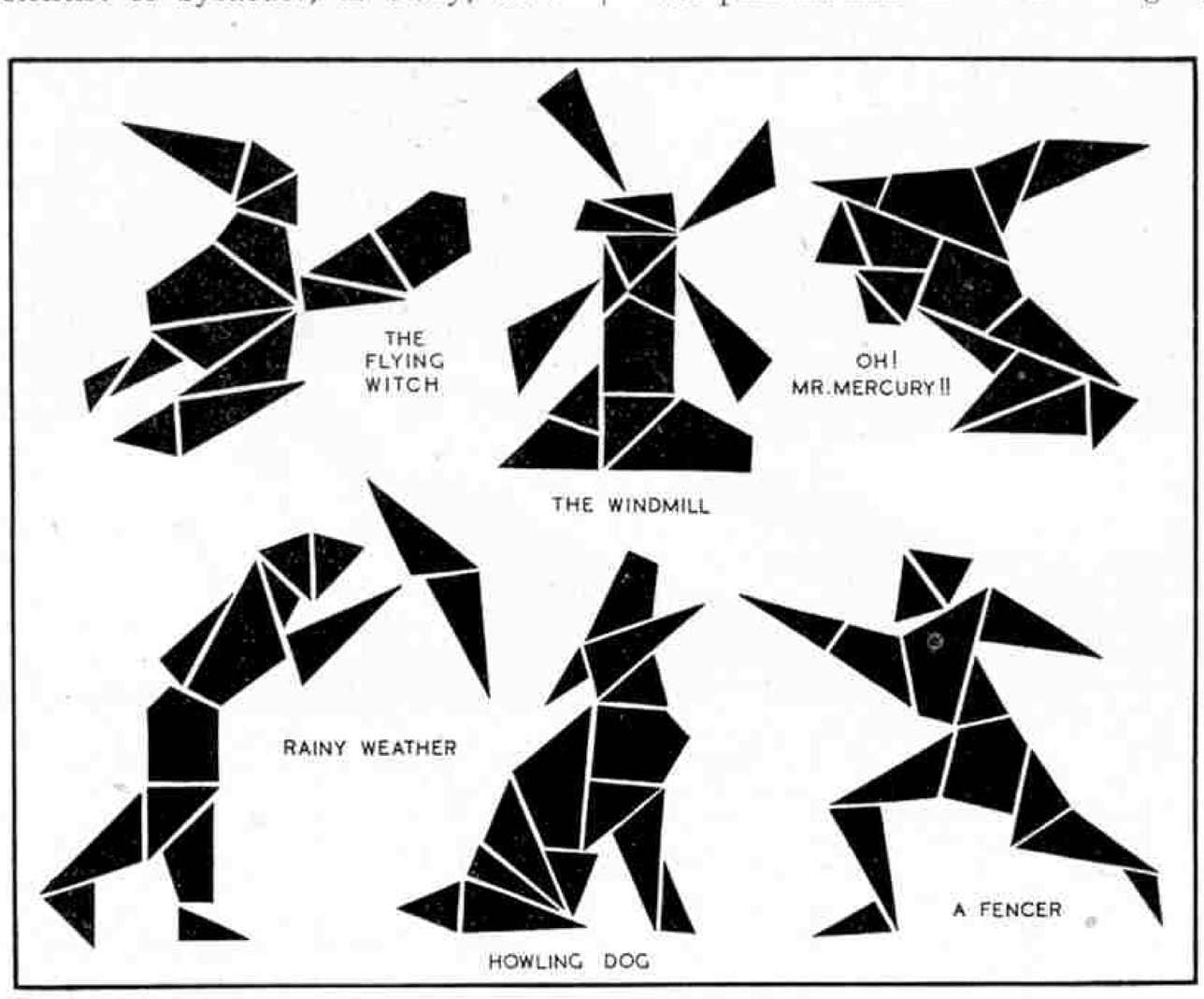
ANOTHER STOMACHION CONTEST

Many new readers will probably say to themselves "What on earth is a Stomachion?" Older readers, however, will recall two or three amusing contests of this type a few years ago, and probably will revel in another.

This puzzle is probably the oldest in the world. It was invented by Archimedes, the famous scientist of Syracuse, in Sicily, who lived in the 3rd century B.C. Archimedes is said to have devised mirrors to burn the ships of the Roman besiegers of his native city and immense grabs to pull the vessels out of the water. He claimed for the puzzle that any object in the world could be depicted with the 14 pieces used in it, and its name, which means that which makes one angry, is said to be due to its capacity for baffling those who try it.

The 14 pieces are cut from a rectangle, and full directions for making them are given at the bottom of this page. They may be in wood or cardboard, and in using them it is important to remember that each picture must contain the full set of 14 parts. That is the one hard and fast rule.

The parts may be juggled about as one wishes, but the best Stomachion pictures seem to be created by accident. One starts to play around with the parts, pushing them here and there, in an effort to find an idea, and suddenly a remote likeness to a particular object will seem to spring up. From that point ingenuity and imagination play a large part—ingenuity in working in the odd piece that always seems to be left over, and imagination in visualising the possibilities of further juggling with the pieces.



The specimens given on this page go a long way to prove the truth of Archimedes' claim. It should be mentioned that in the reproduction gaps have been left intentionally to show how the parts are fitted together. In certain of the originals these lines are not present and the effect is slightly improved by their omission. It is not essential that all parts should fit closely together. Areas of white space can be very usefully employed in building up effect.

Prizes of Meccano products, to be chosen by the winners themselves from the current Meccano catalogue, to the value of 21/–, 15/–, 10/6 and 5/– respectively, are offered to the senders of the four best entries in order of merit. In addition there will be a number of Consolation Prizes. Entries must be addressed to "*Stomachion Puzzle*, Meccano Magazine, Binns Road, Liverpool 13," and must be sent to reach this office not later than 28th February.

The entries need not consist of the actual pieces, although these may be pasted on a card for submission if desired. Diagrams showing the positions of the parts will suffice. Readers may submit as many entries as they wish. Each entry must be on a separate piece of paper.

There will be a separate section for Overseas readers, those living outside Great Britain, Northern Ireland, Eire and the Channel Islands, in which prizes to the same values will be awarded. Overseas entries must arrive not later than 31st May.

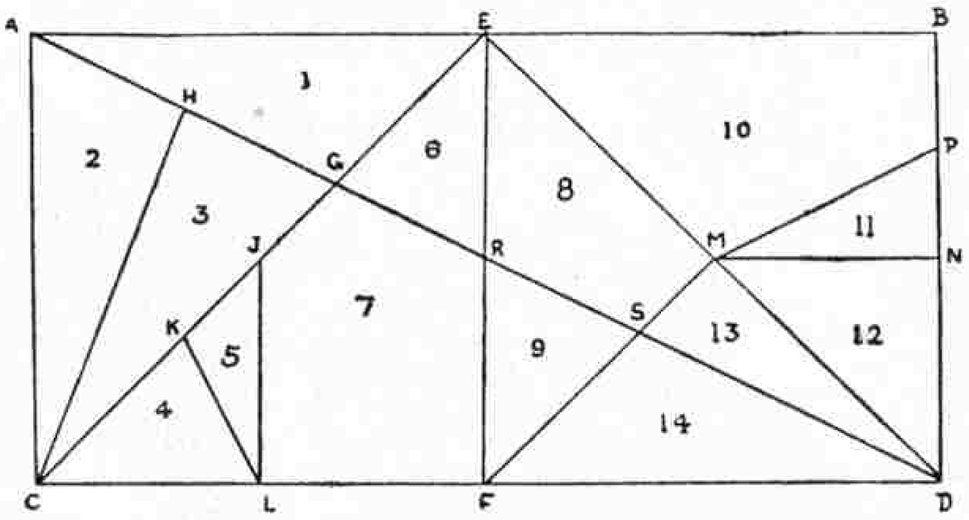
February Drawing Contest

Each month throughout the winter we are holding drawing competitions, open to readers of all ages. No special subjects will be set, the monthly prizes being offered simply for the best drawings or paintings submitted during the month. Entries may be of any size, mounted or unmounted.

Each month's entries will be divided into the usual two sections, A for readers aged 16 and over, and B for those under 16; and prizes of Meccano products or artist's materials, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section. There will be separate sections with similar prizes for Overseas readers.

Entries in the February competition must be addressed "*February Drawing Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 28th February. Overseas closing date, 31st May.

Competitors are asked to note that unsuccessful entries will be returned if a stamped addressed cover of a suitable size is sent for the purpose.



HOW TO MAKE STOMACHION PARTS

The diagram above is twice as long as it is wide. The actual dimensions of the rectangle do not matter as long as this 2 to 1 relationship is preserved. Having marked the rectangle A, B, C, D, find, mark and join the middle points (E and F) of the two long sides. Then draw three diagonals from E to C, E to D, and A to D. Mark the middle points of the diagonals EC and ED, and join these to the middle points of CF and BD. From M connect up with F, and also with P, the middle point of BN. Now find the middle point H of the line joining A to G, the point at which the diagonals AD and EC intersect. Connect H with C. One line only remains to be drawn from L to K. This line runs from L toward the point A, but is not produced beyond the diagonal EC. The pieces are now ready to be cut out and a start can be made with the game.

COMPETITION RESULTS

OVERSEAS

August "Silhouettes" Contest.—1. B. J. Collinson (Sydney). 2. T. Potts (Wellington, N.Z.). 3. M S. Johnston (Capetown). 4. S. B. J. Hill (Toronto).

August Photo Contest.—First Prizes: Section A, G. C. Taylor (Willoughby, N.S.W.); Section B, G. Wong (Singapore, S.S.). Second Prizes: Section A, J. A. Anderson (Ashburton, N.Z.); Section B, T. Wade (Johannesburg).

HOME

"Advertisement Jig-Saw" Contest.—1. R. A. Wood (Middlesbrough). 2. R. A. G. Plane (Ilford). 3. R. W. Begg (Gourock). 4. R. J. Biggs (Bristol 6).

December Drawing Contest.—First Prizes: Section A, G. A. Bailey (London S.E.6); Section B, G. Whalley (Nottingham). Second Prizes: Section A, K. Clark (Alnwick); Section B, A. Stewart (Jarrow).

December Photo Contest.—First Prizes: Section A, W. B. Greenfield (Gateshead 9); Section B, T. B. Roberts (Glasgow). Second Prizes: Section A, H. M. V. Young (Bedford); Section B, C. R. Johnston (Belfast).

November "Doublets" Contest.—1. T. Holden (Whalley, Nr. Blackburn). 2. L. J. Slater (Portsmouth). 3. H. Moss (Oswaldtwistle). 4. H. C. Denham (London S.W.17).

November Drawing Contest.—First Prizes: Section A, J. V. Browne (Luton, Beds.); Section B, K. H. Oliver (Norwich). Second Prizes: Section A, J. C. Hill (Newmarket); Section B, R. Bradshaw (Manchester 14).

November Photo Contest.—First Prizes: Section A, J. R. Tottle (Taunton); Section B, S. J. Coates (London S.W.17). Second Prizes: Section A, J. E. Heydon (Ambergate); Section B, B. R. MacIntyre (Glasgow).

How Fast Can Fishes Swim?

The fastest fish in the world is believed to be the sword-fish. One of these creatures once drove its weapon through an inch of copper sheathing and more than 20 in. of hard wood, and it is estimated that it must have been travelling at more than 60 m.p.h. in order to develop such tremendous force.

The tunny, now a well-known game fish of the North Sea, is thought to attain a maximum speed of 40 m.p.h., while the blue shark may reach 30 m.p.h. It is almost impossible to measure the highest speeds of which fish are capable, however, but successful efforts have been made to measure what may be called their cruising speed, either by means of the cinematograph camera or by hooking fish to a kind of log in which a fine line runs out from a revolving pulley carried on ball bearings. Cinematograph experiments give the blue shark a speed of 24 m.p.h., the tunny 14 m.p.h., and the salmon 11 m.p.h. Among really rapid swimmers are the flying fishes, which reach speeds of over 50 m.p.h.

A Stirring Story of the Danish Invaders

Swords in the Dawn

JOHN O. BEATY. *Illus.* 5/- *net.*

"The wielders of the swords in the dawn are Hengist and Horsa . . . The action is based on historic events, the men taking part in them being as real as knowledge of those ancient times can make them."—*Meccano Magazine.*

Details of dress, weapons and customs are authentic. "A lovely book and should make a much appreciated gift to boys and girls of adolescent years."—*New Chronicle.*

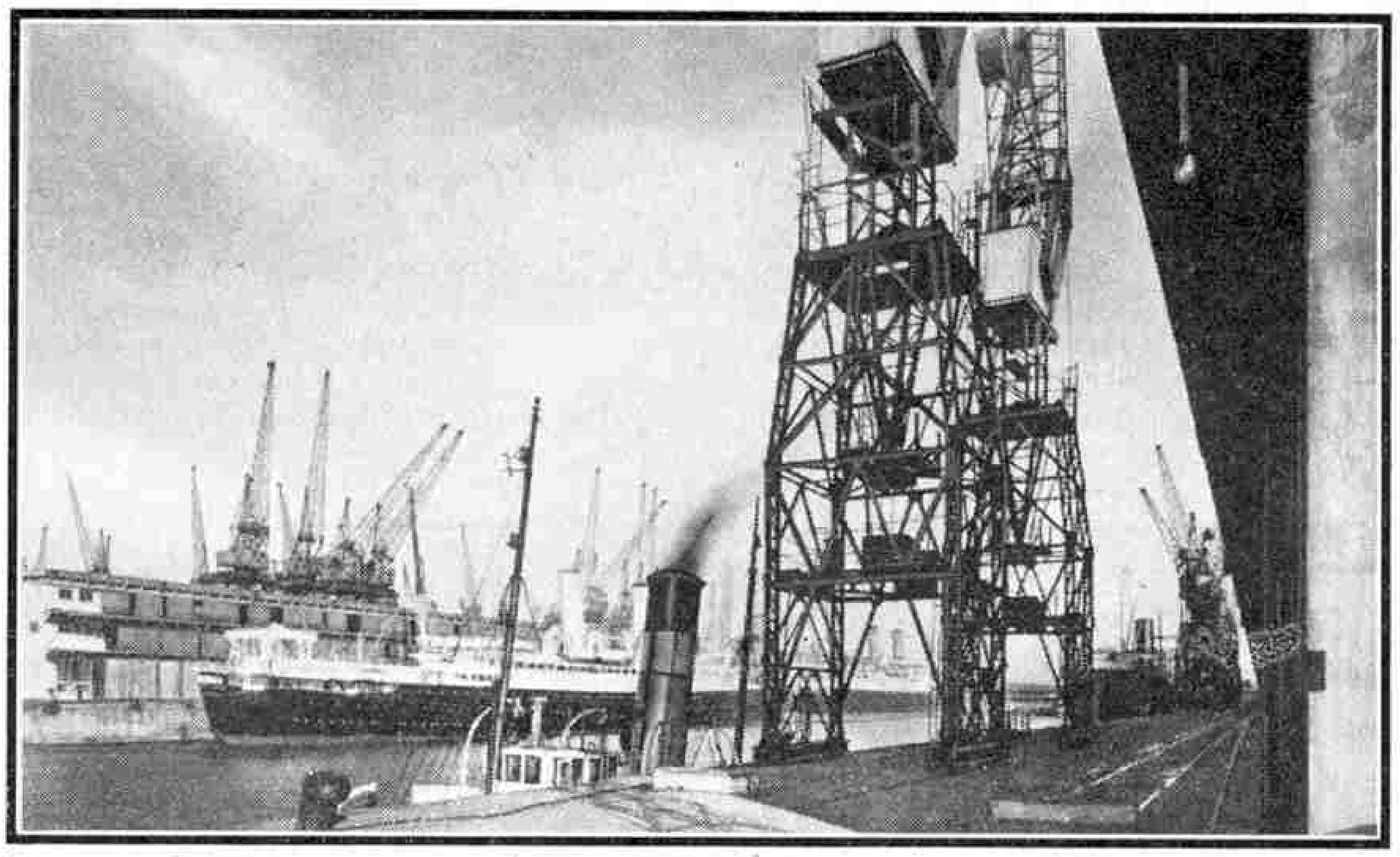
HARRAP

More New Dinky Toys

During this month there will be several notable additions to the Dinky Toys Series, which now includes over 300 varieties. First place among the new arrivals must be given to an attractive scale model of the famous Hawker "Hurricane" single-seater fighter, a type in extensive use by the Royal Air Force, and one of the fastest machines of its kind in the world. The model is available finished in the shadow shading adopted by the Air Ministry (Dinky Toys No. 62h), and in the familiar aluminium finish of the majority of Dinky Toys aircraft (Dinky Toys No. 62s). The beautiful scale model of the Imperial Airways liner *"Frobisher"* introduced last month is being followed by models of the second and third "Frobisher" class machines, *"Falcon"* and *"Fortuna"* (Dinky Toys No. 62w).

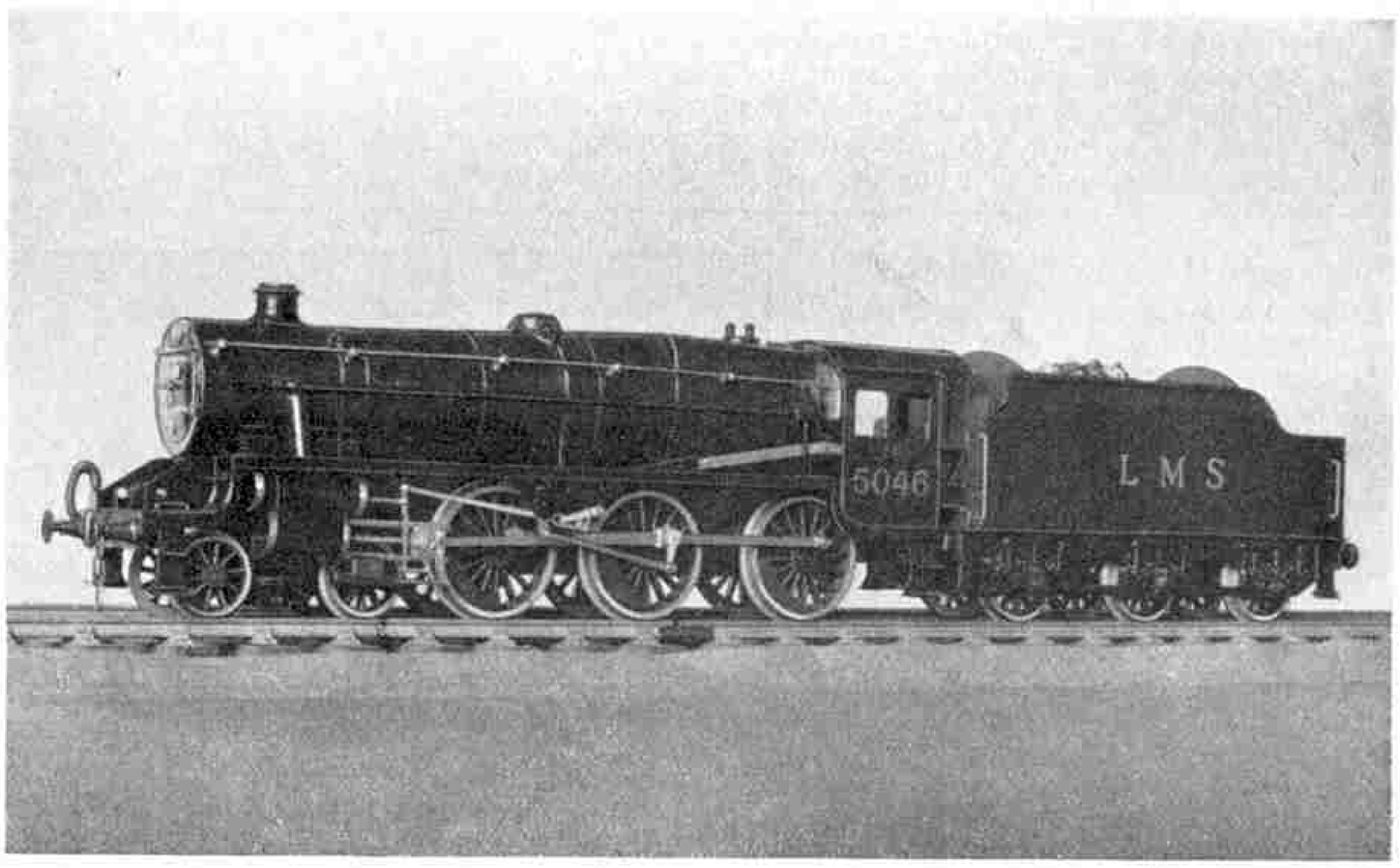
Some of the Dinky Toys civil aircraft are available finished in various colours, and these models appeal particularly to enthusiasts who like to build up fleets of particular types, all the aircraft finished in a certain colour being regarded as representing the fleet of a certain air transport company. These enthusiasts, and they are many, will welcome the introduction of a Dinky Toys British 40-seater Air Liner, available in six different colours. This machine (Dinky Toys No. 62x) is similar to the fine model of the Imperial Airways "Ensign" class air liner introduced in December last. An attractive Giant High-Speed Monoplane resembling the German Junkers Ju 90 and finished in various colours (Dinky Toys No. 62y), is also being introduced.

Readers who are more interested in motor cars will be glad to note the addition of a Streamlined Racing Car (Dinky Toys No. 23s). It is similar to the model of the famous *"Thunderbolt"* racing car used by Captain G. E. T. Eyston, and is available in various colours.



A busy scene in Gladstone Branch Dock No. 1, Liverpool. The Gladstone Dock system has a total water area of about 58½ acres, with three miles of quays, and includes a graving dock 1,050 ft. in length. Photograph by courtesy of the Mersey Docks and Harbour Board.

A Fine Locomotive Model



The illustration above shows an effective Gauge O model of one of the L.M.S. 4–6–0 mixed traffic locomotives of class "5P5F." The model is without motive power, but includes all the working parts of the actual engine, even to Walschaerts valve gear. It successfully reproduces the sturdy and capable appearance of the real locomotives. The engine and tender are complete in external detail and such refinements as spring couplings and dummy vacuum brake pipes are provided. Nickel-silver has been used to represent polished steel, and wood, cardboard and metal also have been used.

Except for the wheels and certain other parts, the engine and tender were built by Mr. L. Rimmer, Liverpool, and our illustration is reproduced by courtesy of the *"Co-Partners Magazine,"* the house organ of the Liverpool Gas Company.



IN A HURRY!

Bones: "Rastus, why am yuh paintin' de fence so fast?"

Rastus: "Boh, I'se tryin' to do it before de paint runs out!"

* * * *

Jim: "Do you know where you can get poultry cheap?"

Tom: "No, where?"

Jim: "At the swimming bath. You can get as many 'ducks' as you like for threepence!"

* * * *

"Is there anything you can do better than anyone else?"

"Yes," replied the small boy, "I can read my own writing."

* * * *

Officer to Raw Recruit: "Don't you know better than point an empty gun at me?"

Startled Recruit: "But it's not empty, sir, it's loaded."

* * * *

Harry (asking teacher a question): "Mr. Brown, could you punish a boy for something he didn't do."

Mr. Brown: "Why, of course not."

Harry: "Good, I didn't do my homework."

* * * *

Visitor: "I sent you some suggestions telling you how to make your paper more interesting. Have you carried out any of my ideas?"

Editor: "Did you meet the office boy with the waste basket as you came upstairs?"

Visitor: "Yes, I did."

Editor: "Well, he was carrying out your ideas."

* * * *

"I hear you've at last decided to get rid of that old car of yours."

"Yes, it's hopeless. Every time I park the thing, up comes a policeman and asks if I've reported the accident."

* * * *

Schoolmaster: "Why do we speak of the wisdom of a serpent?"

Willie: "Because you can't pull its leg, sir."

* * * *

"I say, waiter, I have only a shilling. What do you recommend?"

"Another restaurant, sir."

* * * *

"Why should you ride a mule if you wish to be rich?"

"Because you are no sooner on than you are better off."

* * * *

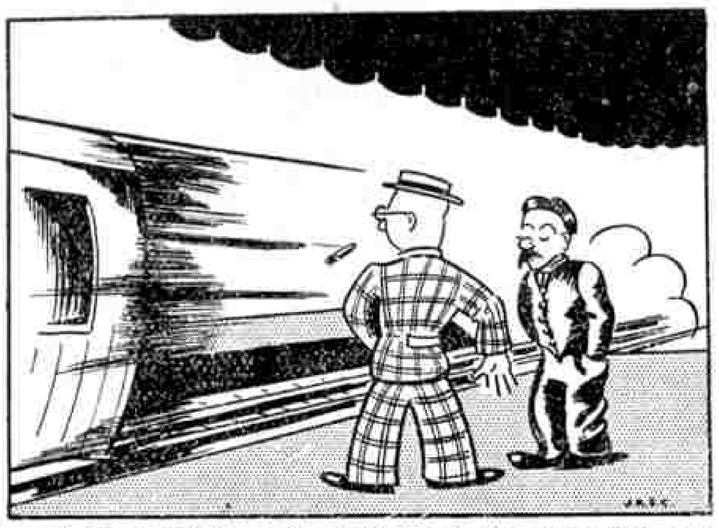
Cockney Guide: "This 'ere 'ouse, sir, is where the famous Catherine of Aragon is said to 'ave bin bit by a mad dog."

Tourist (thoughtfully): "H'm, Tudor."

Guide: "Yus, sir, chewed 'er somethink awful."

* * * *

NO CAUSE FOR ALARM



At the station of a small town an American was boring a porter with tall talk of his own country, where everything was done better than here, when the *'Silver Jubilee"* flashed by at about 80 m.p.h.

"What's that?" said the American.

"Oh," said the fed-up porter, "That's only old George doin' a bit of shuntin'."

QUITE SIMPLE

Mr. Brown looked at the letter on his desk.

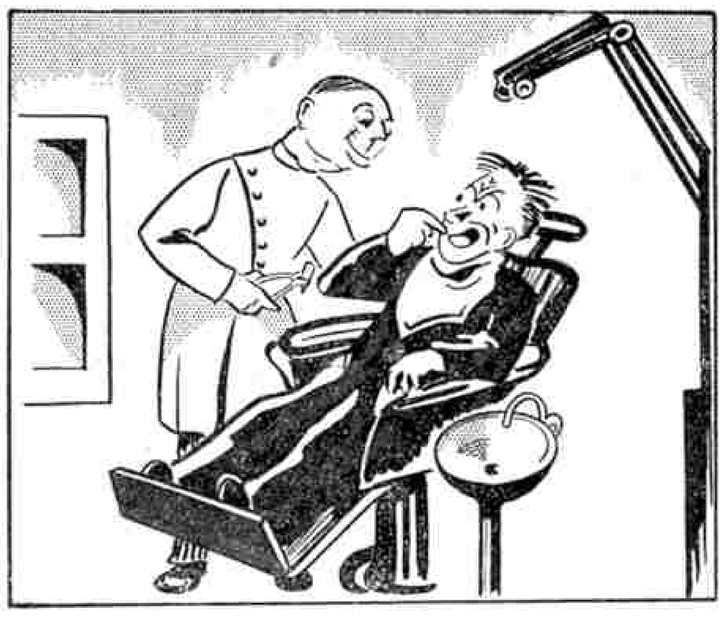
"We are very surprised," it read, "that the money we have demanded so often has not yet arrived."

Turning to his Secretary, he dictated his reply:

"Dear Sirs—You do not need to be surprised, I have not sent it."

* * * *

NEXT TURN



Victim: "Here, that wasn't the right tooth you pulled out!"

Dentist: "Be patient, I'm coming to it."

* * * *

Teacher: "Ernest, why don't you comb your hair?"

Ernest: "I haven't got a comb."

Teacher: "Why don't you ask your mother to buy you a comb?"

Ernest: "'Cause then I would have to comb my hair."

* * * *

Judge: "You were found under the bed with a bagful of tools."

Prisoner: "It was force of habit, M'lord. I used to be a motor mechanic."

* * * *

Teacher: "We've had the Stone Age and the Bronze Age, now somebody give me another age."

Boy (timidly): "Please sir, Sausage."

* * * *

Teacher: "Spell 'dog'?"

Small Boy: "D-u-"

Teacher: "There's no 'u' in 'dog'."

Small Boy: "Well, there was when he was a pup."

* * * *

Fond Mother: "Where did you get that black eye, Harold? Didn't I tell you that good little boys never fight?"

Harold: "Yes, Mother, and I believed you. I thought he was a good little boy and hit him; then I found out he wasn't."

* * * *

Tom: "Why is a gardener like a story writer?"

Jim: "I don't know."

Tom: "Because he works up his plot."

* * * *

"Didn't you guarantee when you sold me this car that you would replace anything that broke?"

"Yes, sir. What is it?"

"I want a new garage door."

* * * *

Teacher: "An abstract noun is something you can think of but not touch. Now give me an example."

Bobby: "A red-hot poker."

* * * *

Jack and Bill were working with blowlamps on a building when the foreman called out. Bill turned round and his blowlamp was directed on to Jack's ear. Some seconds later Jack exclaimed: "I say, Bill, somebody ain't arf talking abaht me!"

* * * *

THIS MONTH'S HOWLER

Guerilla warfare means that they are up to their monkey tricks again.

TOUGH

Diner: "Waiter, what sort of bird is this?"

Waiter: "It's a wood pigeon, sir."

Diner: "I thought so. Get me a saw."

* * * *

"A young hen is called a pullet," said teacher. "Now what is a young bull called?"

"Please sir, a bullet!" answered Willie.

* * * *

Hanging outside a butcher's shop was the following notice: "Joints to suit all purses." A woman entered and asked the butcher if he had anything to suit an empty purse.

"Yes, madam," replied the proprietor, "the cold shoulder."

* * * *

Tramp: "Could you give a poor fellow a bite?"

Housewife: "I don't bite, but I'll call the dog."

* * * *

Judge: "How did you beat the witness in this frightful manner?"

Accused: "Come outside and I will show you!"

* * * *

Jones: "When my father blows his nose it sounds like a trumpet."

Smith: "That's nothing; when my dad blows his all the men at his factory leave off work."

* * * *

He was charged with begging.

"I'm not a lazy man, sir," he pleaded. "I work when I get work, but I've been out of a job."

"Look at his hands, sergeant," said the magistrate.

The sergeant looked at the prisoner's hands.

"Why, sir, it must be years since the old scoundrel did any work. His hands are as soft as mine."

* * * *

Teacher: "Define the first person?"

Pupil: "Adam, sir."

* * * *

Mistress: "Sarah, bring in the coal before it get's dark!"

Sarah: "Please, mum, it's dark already, in fact it's quite black!"

* * * *

"Is he mean?"

"Yes, he's so mean that if he were a ghost he wouldn't give you a fright."

* * * *

Visitor: "Don't you wish you were young again?"

Oldest Inhabitant: "No fear! My old age pension is due next week."

* * * *

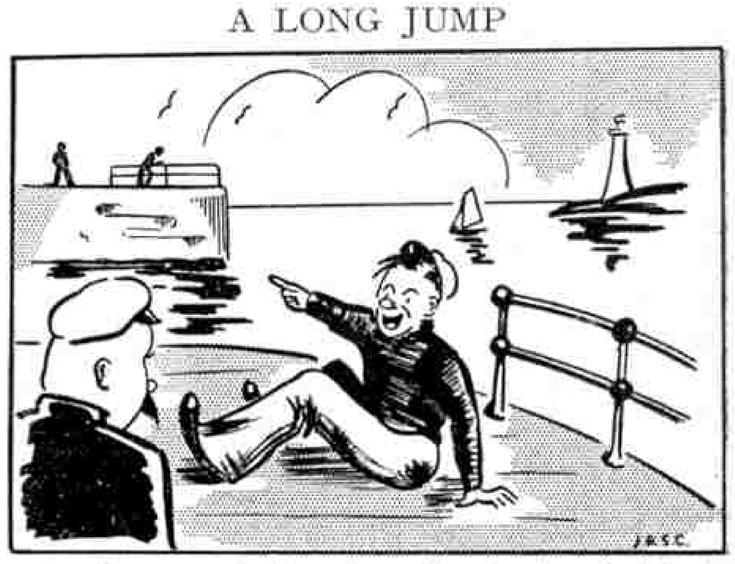
Customer: "Have you any apples?"

Grocer: "Do you want them to cook or to eat?"

Customer: "Both. That's what I cook 'em for."

* * * *

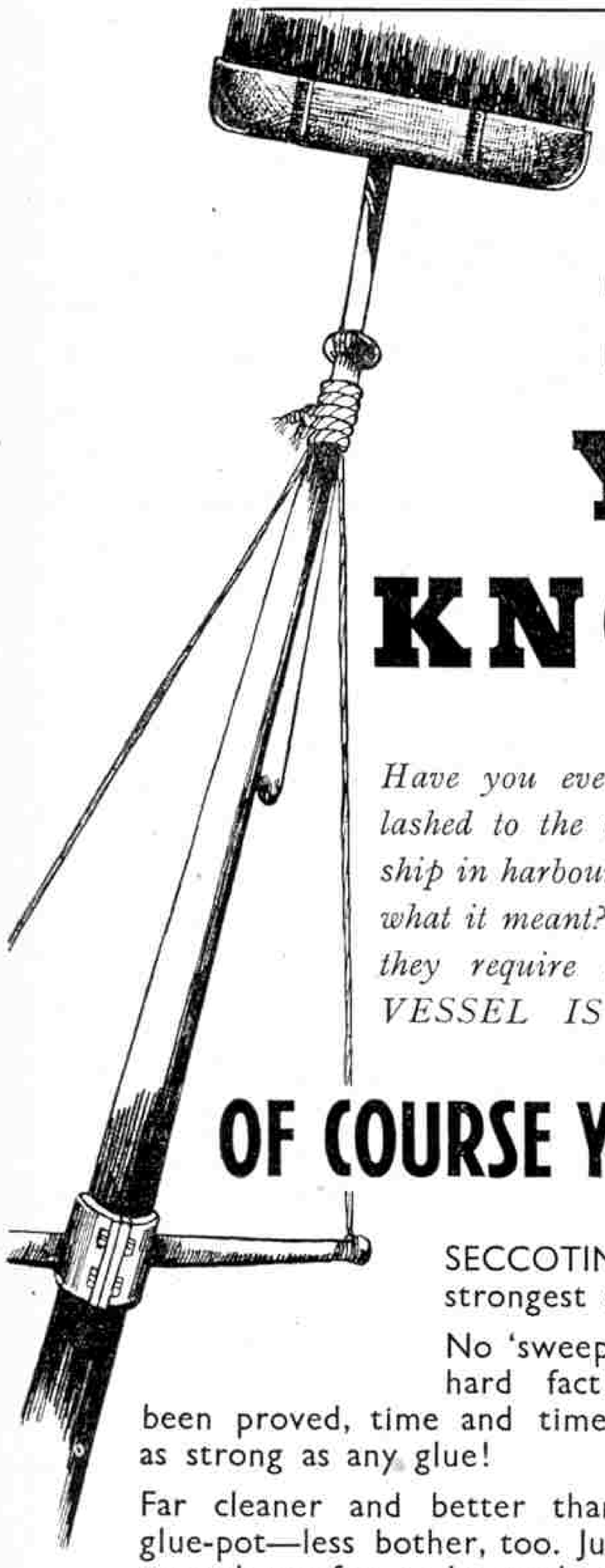
A LONG JUMP



A sailor went dashing down the pier to a boat just as it was pulling out. The boat had moved off three or four yards, and he jumped and fell, hitting the back of his head. For several minutes he lay stunned.

When he came to, the boat was several hundred yards from shore. He looked back, blinked a time or two, and shouted:

"Boy! Oh, boy, can I jump!"



DID YOU KNOW?

Have you ever seen a broom lashed to the main mast of a ship in harbour—and wondered what it meant? It doesn't mean they require a sweep—THE VESSEL IS FOR SALE!

OF COURSE YOU KNOW

SECCOTINE is the world's strongest adhesive?

No 'sweeping' claim—this, but hard fact! SECCOTINE has been proved, time and time again, to be twice as strong as any glue!

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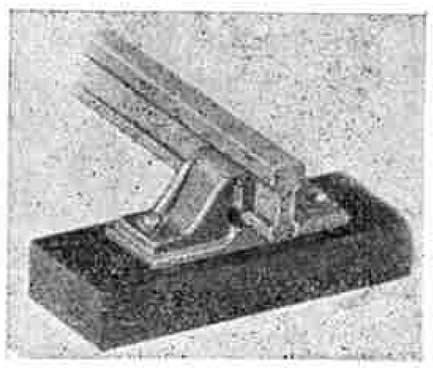
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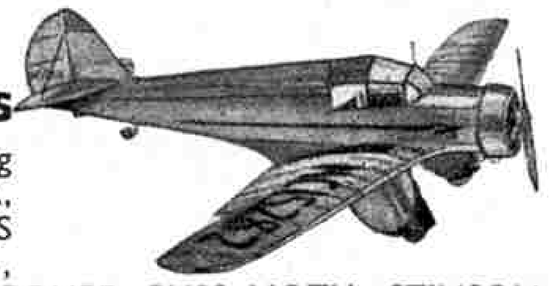
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Steel Rail, sheradised, per yd. **2d.**, **1/8** doz. yds.
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Pins, approx. 1,000 ... **6d.** packet
Track Gauge, special, with elec. chair jig **9d.** each

All prices plus postage.
We can supply track parts for "OO" Railways, see Catalogue for prices.

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Kits for 12" wing span Flying Models of the AERONCA, BOEING P12E, CURTISS PURSUIT, HELL DIVER, LOCKHEED VEGA, MONOCOUPE, PUSS MOTH, STINSON RELIANT, TAYLOR CUB, VULTEE VIA, WACO, GULF HAWK, HORNET MOTH, MILES MAGISTER. Price **9d.** Postage 3d.

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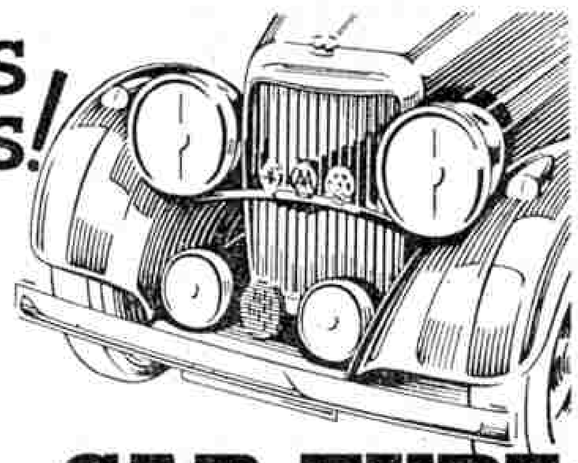
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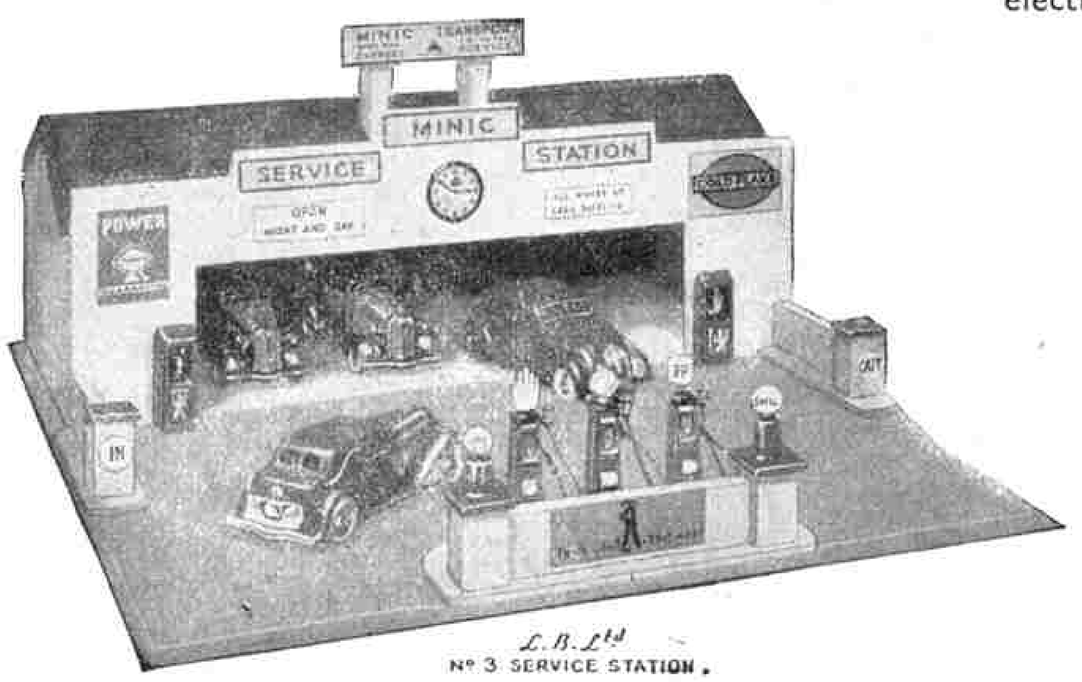
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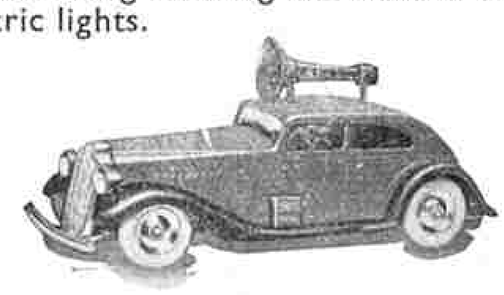
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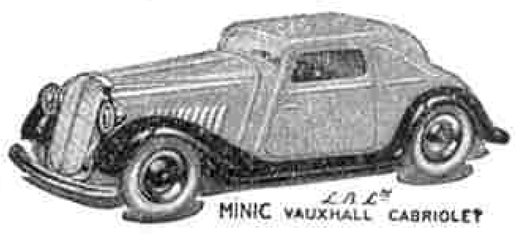


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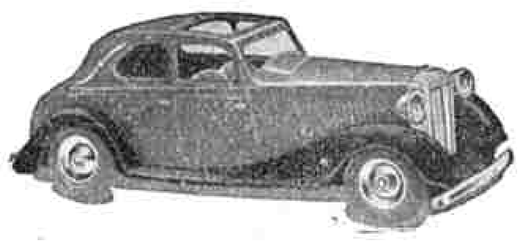
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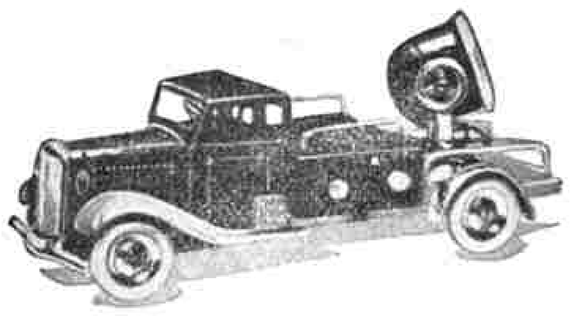
MINIC Traffic Control Car.
LENGTH 5 ins. Price **1/6**



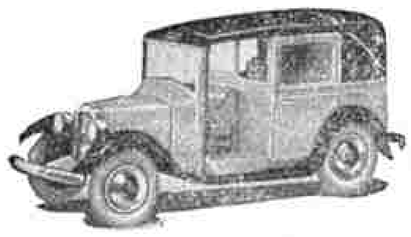
MINIC Vauxhall Cabriolet
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MINIC Daimler Sunshine Saloon with Electric Headlamps and Battery.
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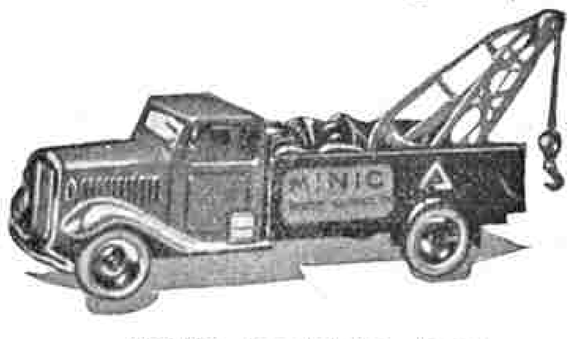
MINIC Searchlight Lorry with Electric Searchlight and Battery.
LENGTH 5¼ ins. Price **3/6**



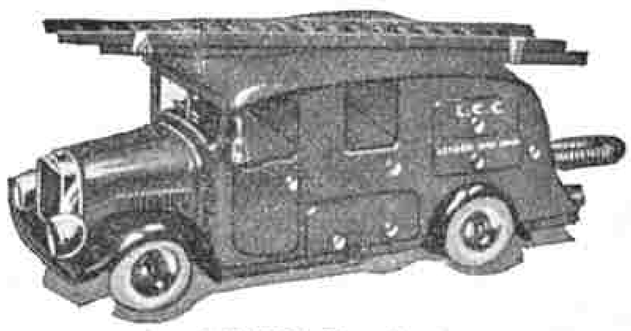
MINIC Taxi.
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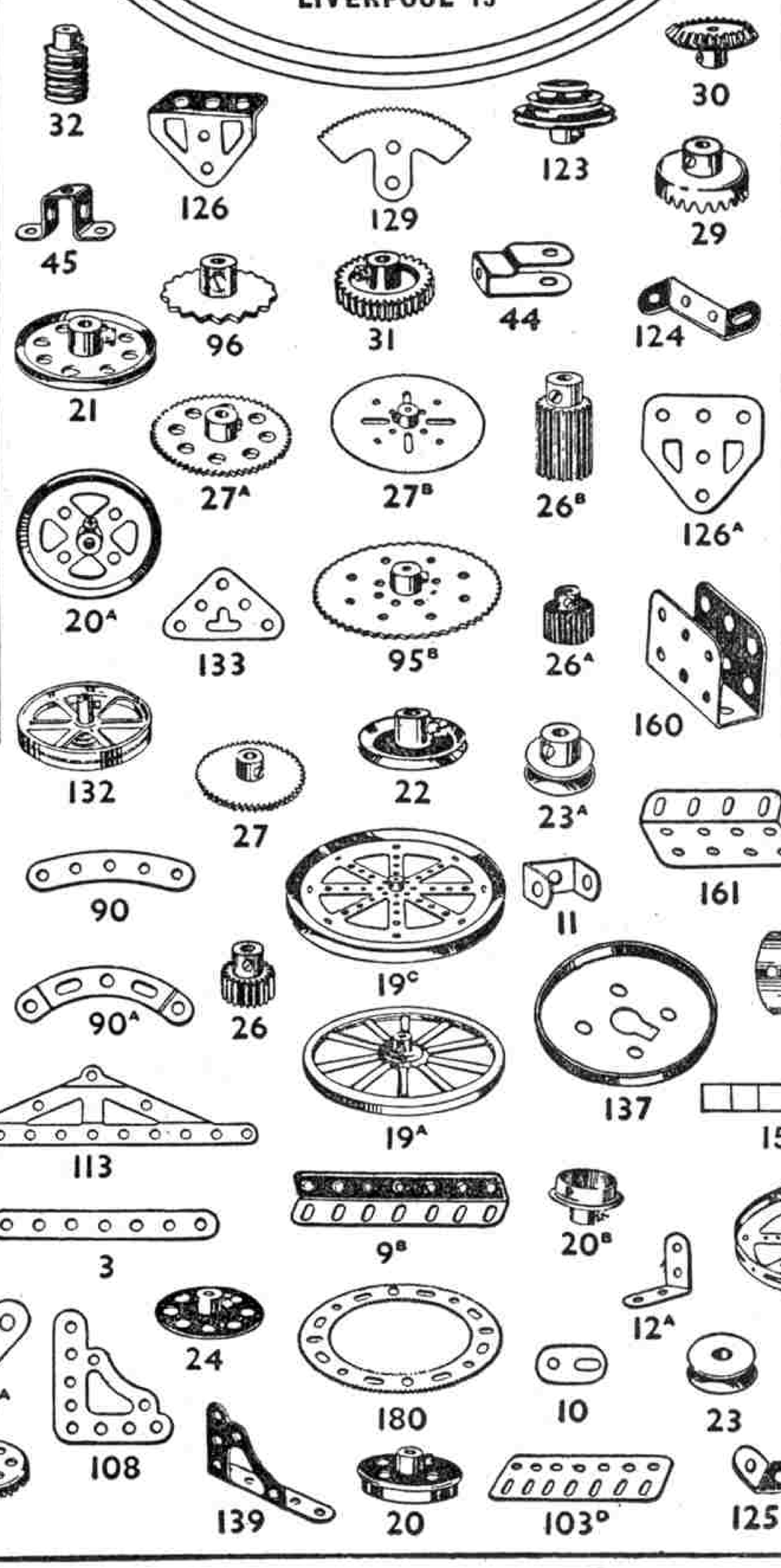
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PRICES OF PARTS ILLUSTRATED

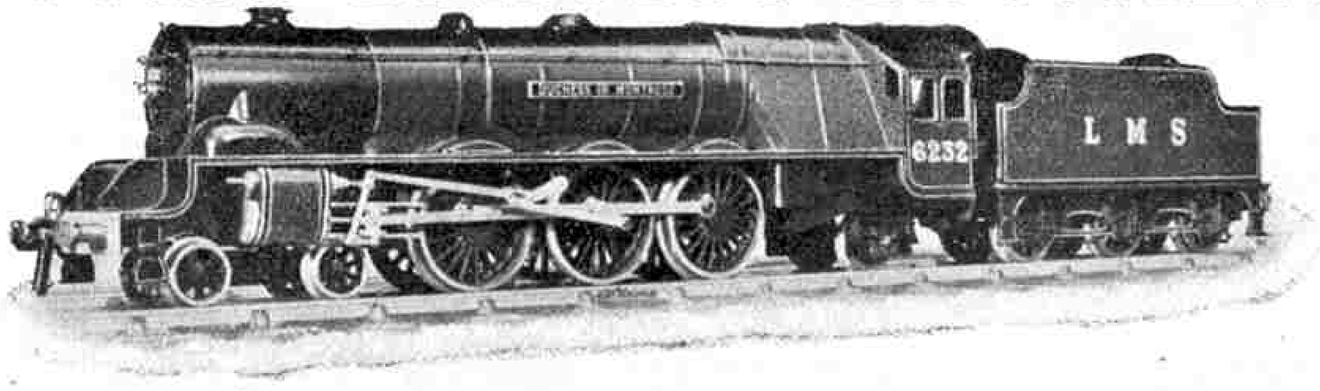
No.			s.	d.
3.	Perforated Strips, 3½"	½ doz.	0	6
9b.	Angle Girders, 3½"	„	0	9
10.	Flat Brackets	doz.	0	1
11.	Double Brackets	„	0	3
12a.	Angle Brackets, 1" x 1"	„	0	8
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1½" diam.	„	0	3½
20b.	„ „ ½" „	„	0	2½
	Pulley Wheels			
19c.	6" dia., with centre boss and set screw	„	1	9
20a.	2" „ „ „	„	0	3½
21.	1½" „ „ „	„	0	3
22.	1" „ „ „	„	0	2
23a.	½" dia. with centre boss and grub screw	„	0	2
22a.	1" dia. without centre boss and set screw	„	0	1
23.	½" „ „ „	„	0	1½
24.	Bush Wheels	„	0	2½
26.	Pinion Wheels, ½" dia., ½" face	„	0	3½
26a.	„ „ ½" „ ½" „	„	0	4½
26b.	„ „ ½" „ ½" „	„	0	6
	Gear Wheels			
27.	50 teeth, to gear with ½" Pinion	„	0	4
27a.	57 „ „ „ ½" „	„	0	5
27b.	133 „ „ „ ½" „	„	1	3
28.	Contrate Wheels, 1½" diam.	„	0	6
29.	„ „ ¾" „	„	0	4
30.	Bevel Gears, ⅞", 26 teeth	„	0	6
31.	Gear Wheels, 1", 38 teeth	„	0	9
32.	Worms	„	0	3½
44.	Cranked Bent Strips	„	0	1
45.	Double „ „	„	0	1
46.	Double Angle Strips, 2½" x 1"	½ doz.	0	8
55.	Perforated Strips, slotted, 5½" long	doz.	1	3
77.	Triangular Plates, 1"	each	0	1
90.	2½" Curved Strips, 2⅜" radius	„	0	1
90a.	2½" Curved Strips, cranked, 1⅛" radius, 4 to circle	„	0	1

PRICES OF PARTS ILLUSTRATED (Cont.)

No.			s.	d.
95b.	Sprocket Wheels, 56 teeth, 3" diam.	each	0	7
96.	Sprocket Wheels, 18 teeth, 1" diam	„	0	3
102.	Single Bent Strips	„	0	1
103d.	Flat Girders, 3½" long	½ doz.	0	9
108.	Architraves	doz.	1	9
110.	Rack Strips, 3½" long	each	0	2
113.	Girder Frames	„	0	3
118.	Hub Discs, 5½" diam.	„	1	0
123.	Cone Pulleys	„	1	0
124.	Reversed Angle Brackets, 1"	½ doz.	0	4½
125.	„ „ „ ½"	„	0	3
126.	Trunnions	each	0	1½
126a.	Flat Trunnions	„	0	1
129.	Rack Segments, 3" diam.	„	0	5
132.	Flywheels, 2⅜" diam.	„	2	0
133.	Corner Brackets, 1½"	„	0	1
133a.	„ „ 1"	„	0	1
137.	Wheel Flanges	„	0	2½
139.	Flanged Brackets (R.H.)	„	0	2
145.	Circular Strips, 7½" diam. overall	„	1	0
147.	Pawls, with Pivot Bolt and Nuts	„	0	3
148.	Ratchet Wheels	„	0	4
154a.	Corner Angle Brackets, ½", right hand	½ doz.	0	3
154b.	Corner Angle Brackets, ½", left hand	„	0	3
158a.	Signal Arms, Home	each	0	5
160.	Channel Bearings, 1½" x 1" x ½"	„	0	2
161.	Girder Brackets, 2" x 1" x ½"	„	0	1½
167.	Geared Roller Bearings	„	20	0
168.	Ball Bearings, 4" diam.	„	3	0
170.	Eccentrics, ½" throw	„	0	9
180.	Toothed Gear Rings, 3½" diam. 133 external teeth / 95 internal „	„	1	0
197.	Strip Plates, 12½" x 2½"	„	0	7
200.	Curved Plates, 1 11/16" radius	„	0	1½
211a.	Helical Gears, ½" (*Can only be used together*)	„	0	10
211b.	„ „ 1½" (*Can only be used together*)	„	2	3
216.	Cylinders, 2½" long	„	0	3½



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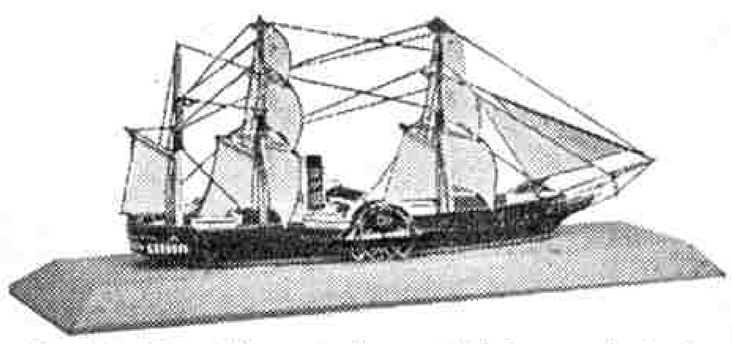
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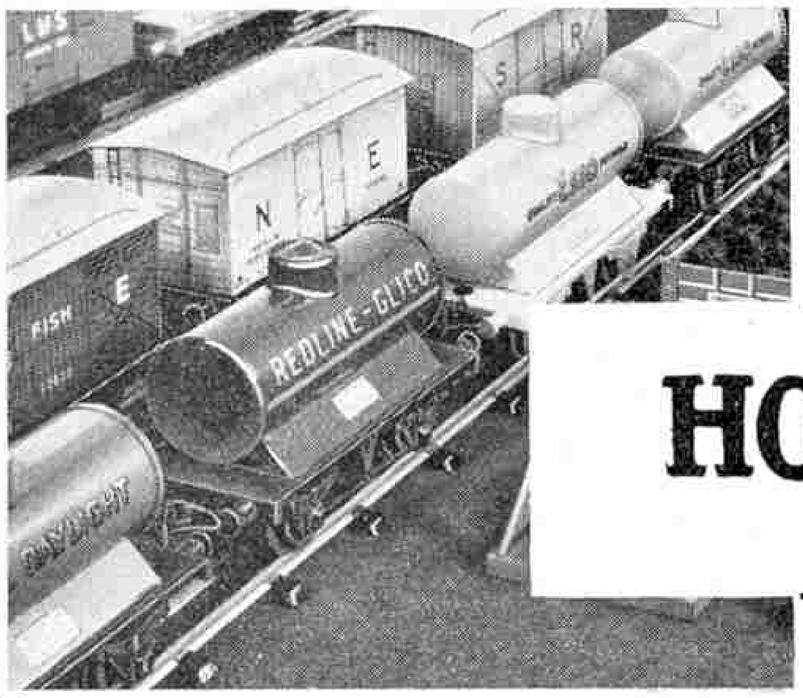
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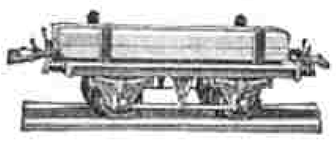


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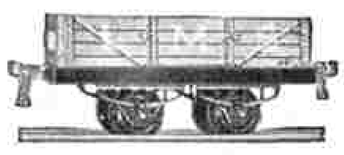
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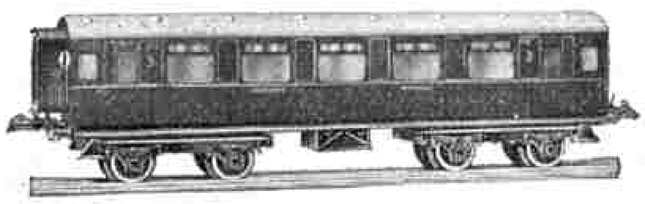
GAUGE O



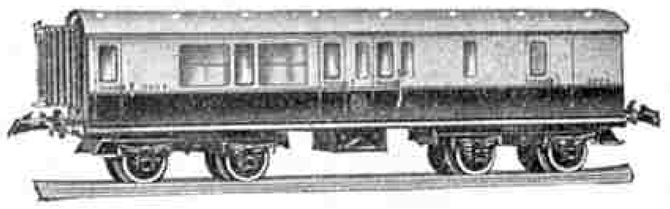
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Price **1/3**



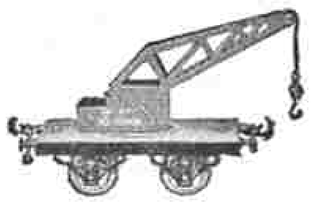
***M1 WAGON**
Price **10d.**



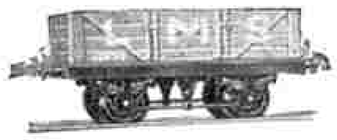
No. 2 CORRIDOR COACH
S.R. Third class. Not suitable for 1 ft. radius rails. Price **7/6**



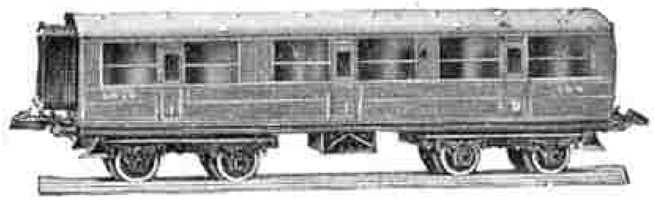
No. 2 CORRIDOR COACH
G.W. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



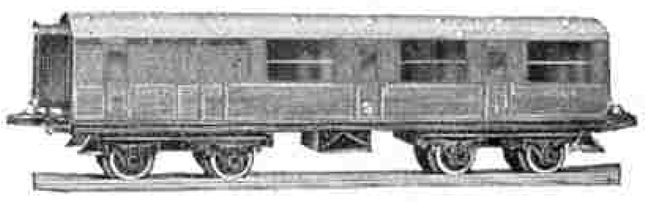
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Price **2/9**



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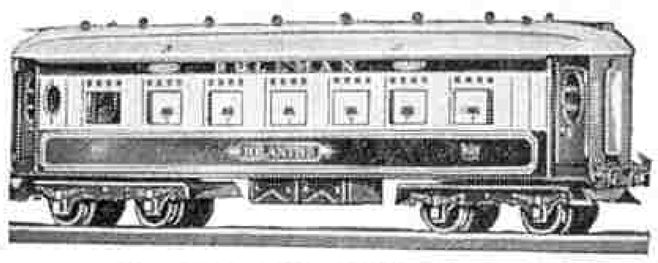
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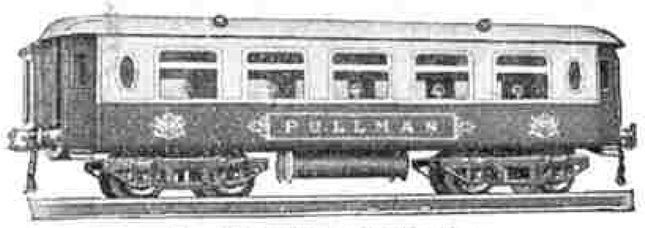
No. 2 CORRIDOR COACH
L.N.E.R. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



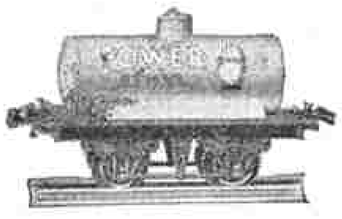
TROLLEY WAGON WITH CABLE DRUMS
Fitted with two Cable Drums. Not suitable for 1 ft. radius rails. Price **4/6**



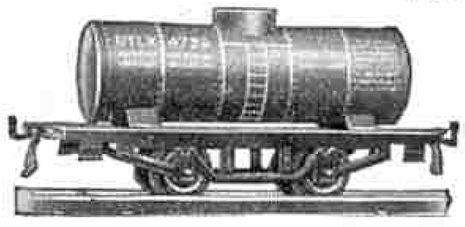
No. 2 SPECIAL PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **13/6**



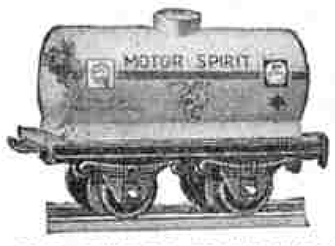
No. 2 PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **10/6**



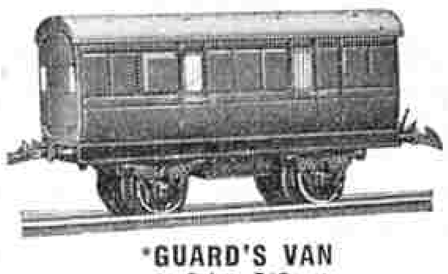
No. 1 PETROL TANK WAGON "POWER ETHYL"
Price **1/11**



TANK CAR (American Type)
As used in America for the conveyance of oil, etc. Price **1/11**



MO PETROL TANK WAGON "SHELL-B.P."
(MO Coupling.) Price **1/-**



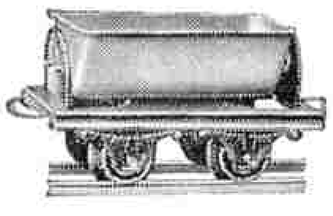
***GUARD'S VAN**
Price **2/6**



MO CRANE TRUCK
(MO Coupling.) Price **1/-**



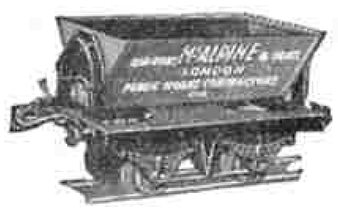
FIBRE WAGON
As used in France and other Continental countries.
Price **1/3**



MO SIDE TIPPING WAGON
(MO Coupling.) Price **1/-**



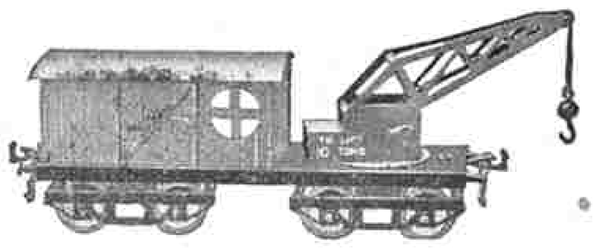
***No. 2 LUGGAGE VAN**
Opening double doors. Not suitable for 1 ft. radius rails. Price **4/6**



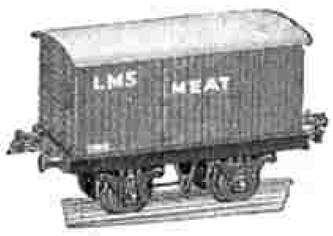
No. 1 SIDE TIPPING WAGON
"Sir Robert McAlpine and Sons." Price **2/-**



BRAKE VAN
Opening doors. In N.E. or S.R. lettering. Price **2/9**



***BREAKDOWN VAN AND CRANE**
Sliding doors. Not suitable for 1 ft. radius rails. Price **5/11**



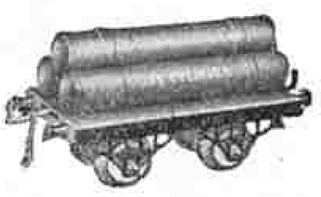
No. 0 MEAT VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**



No. 0 FISH VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**



***FLAT TRUCK**
with Cable Drum.
Price **1/9**

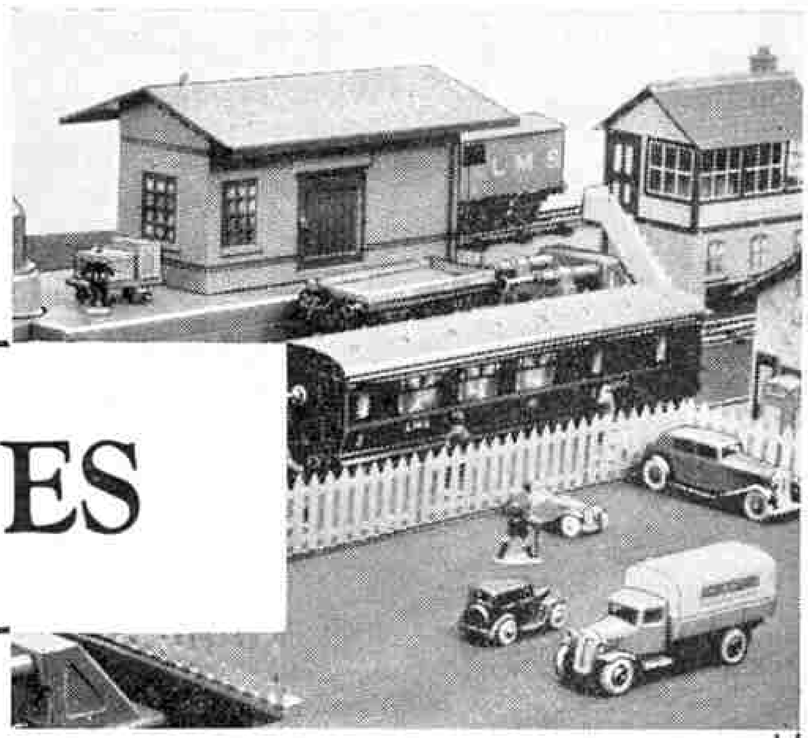


GAS CYLINDER WAGON
Price **1/8**

Lettered L.M.S., N.E., G.W. or S.R.

There is a splendid range of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway can be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.



HORNBY ACCESSORIES

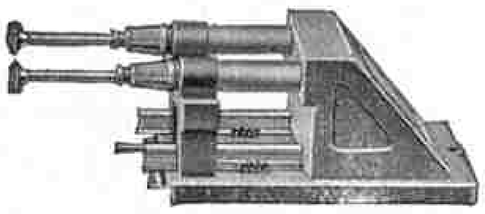
GAUGE O



No. 3 STATION
Length 16¾ in., width 6 in., height 6 in. ... ... Price **5/9**

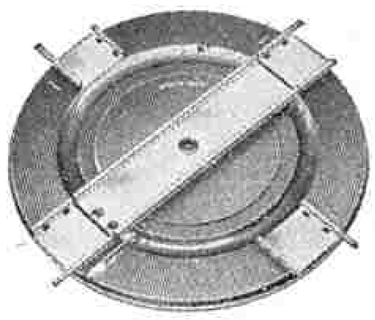


No. 2 SIGNAL CABIN
Dimensions: Height 6⅛ in., width 3⅛ in., length 6⅛ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired.
Price **3/6**



No. 2A BUFFER STOPS
Hydraulic type. Price **2/9**

No. 3A BUFFER STOPS
Similar in design to No. 2A Buffer Stops, but fitted for use with Hornby Solid Steel Track. Price **3/6**



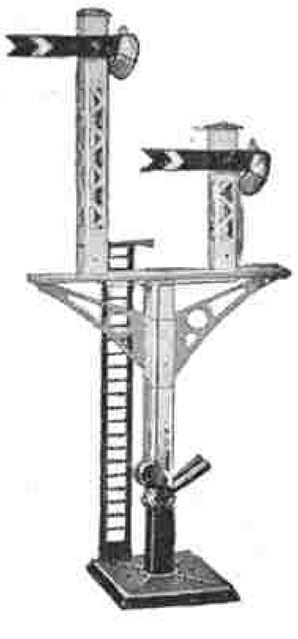
No. 1 TURNTABLE
Price **1/11**



No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price **4/3**



No. 2 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price **2/3**

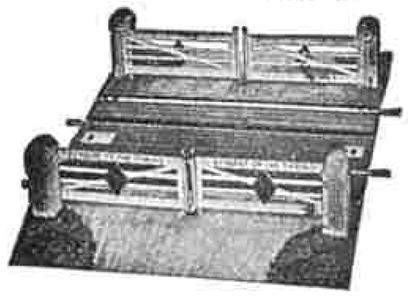


No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic model.
Price **5/-**



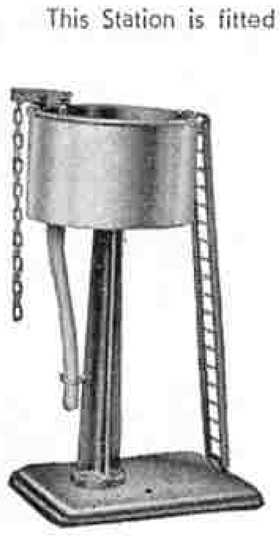
No. 4 STATION
Built up with three detachable sections. Named "Margate," "Wembley," "Ripon" or "Reading." Strikingly coloured, with accessible Booking Hall and Ticket Office Barrier ... ... Price **10/6**

No. 4E STATION
This Station is fitted for electric lighting, otherwise it is the same as No. 4 Station ... ... Price **11/9**

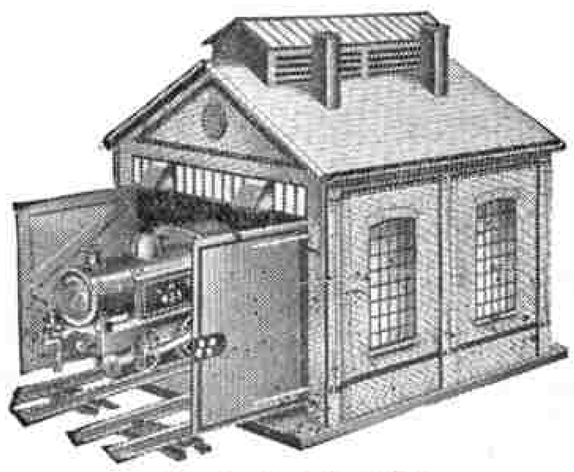


No. 2 LEVEL CROSSING
Measures 13¼ x 10¼ in., with two tracks of gauge O rails in position. Price **5/3**

No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks. Price **7/3**



No. 1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever.
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No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price **15/6**

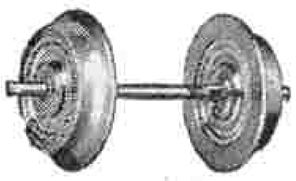


No. 2 LAMP STANDARD
Price **3/9**



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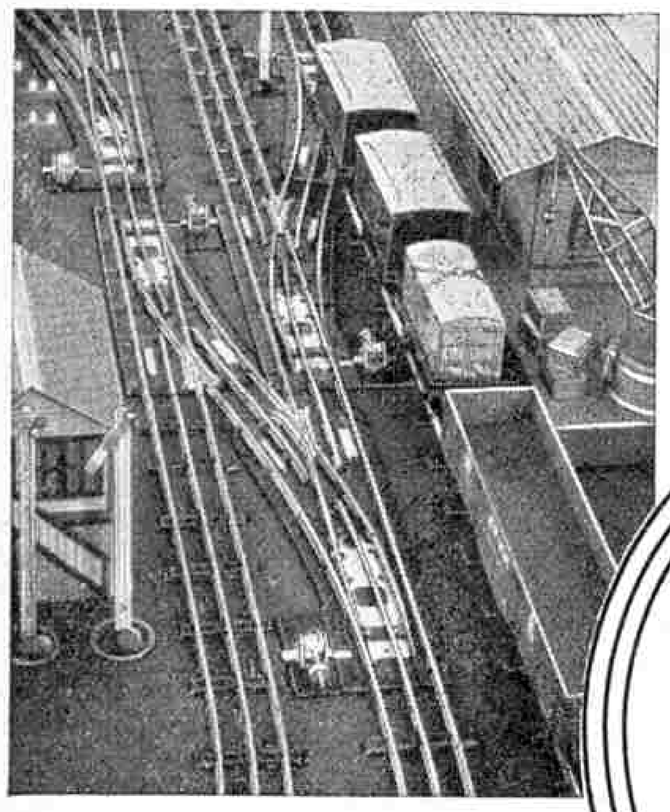
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Price per pair **3d.**

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HORNBY



SOLID STEEL RAILS

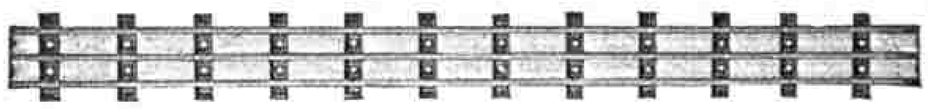
Although our standard tinplate rails are the acknowledged best of their class, we have felt that in order to do justice to the speed and hauling power of our locomotives, especially "PRINCESS ELIZABETH" and E420 "ETON," a drawn steel rail was essential. We set out to produce the perfect miniature railway track, and we have achieved our aim in the system of electric steel rails and points that we have introduced. These rails are of the very highest quality, yet are sold at reasonable prices. We are confident that they will give satisfaction, not only to Hornby Train users, but to all model railway enthusiasts. The track is joined up by means of fishplates which are supplied with each rail.

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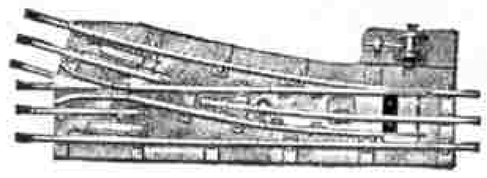


ELECTRIC STRAIGHT RAILS

EB3	Straight Rails (Length 23 in.)	each **2/8**
EB3½	Straight Half Rails	" **1/7**
EB3¼	Straight Quarter Rails	" **1/-**
	TSR Electrical Terminal for Solid Section Rail	per pair **4d.**

ELECTRIC CURVED RAILS

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EA3½	Curved Half Rails	" **1/7**



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EPR3	Right-hand Points	each **8/3**
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FP for joining up track ... ... Price, doz. **6d.**

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HORNBY TINPLATE TRACK



EB1



ECR



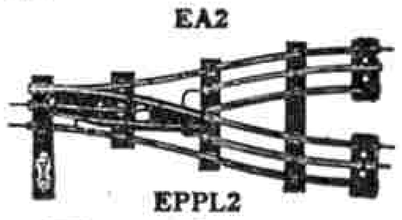
EA2½



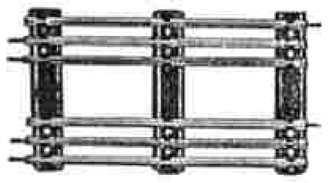
EB½



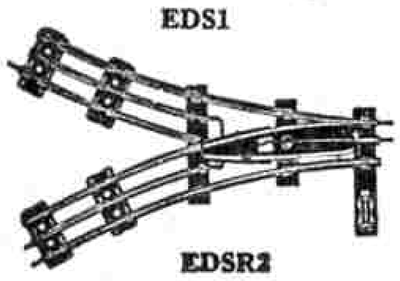
EA2



EPPL2



EDS1



EDSR2

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EB½ " half rails ...	" "	5/-	
EA2¼ Curved quarter rails (2 ft. radius)	" "	4/6	
EA2 Curved rails (2 ft. radius)	" "	6/-	
EPPR2 Parallel points, right-hand	per pair	7/-	
EPPL2 Parallel points, left-hand			
These points can be used with either 1 ft. or 2 ft. radius track.			
EPR2 Right-hand points (2 ft. radius)	per pair	8/-	
EPL2 Left-hand points (2 ft. radius)			
EPR1 Right-hand points (1 ft. radius)	per pair	6/6	
EPL1 Left-hand points (1 ft. radius)			

EDS1 Straight rails, double track	¼ doz.	8/6
EDSR2 Double symmetrical points, right-hand (2 ft. radius)	per pair	7/-
EDSL2 Double symmetrical points, left-hand (2 ft. radius)		
EDSR1 Double symmetrical points, right-hand (1 ft. radius)	per pair	7/-
EDSL1 Double symmetrical points, left-hand (1 ft. radius)		

FOR CLOCKWORK TRAINS

B1 Straight rails	per doz.	4/-
A1 Curved rails (1 ft. radius)	" "	4/-
PR1 Right-hand points (1 ft. radius)	per pair	3/6
PL1 Left-hand points (1 ft. radius)		
PR2 Right-hand points (2 ft. radius)	per pair	3/6
PL2 Left-hand points (2 ft. radius)		

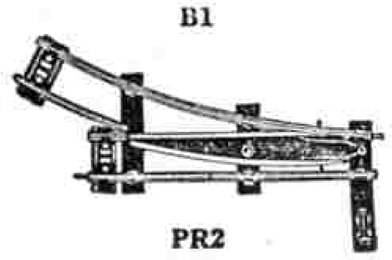
CA2 Acute-angle crossings (for 2 ft. radius track) ...	each	1/6
PPR2 Parallel points, right-hand	per pair	4/-
PPL2 Parallel points, left-hand		
These points can be used for either 1 ft. or 2 ft. radius track.		
DC2 Curved rails, double track, 2 ft. radius only ...	¼ doz.	6/-

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B1



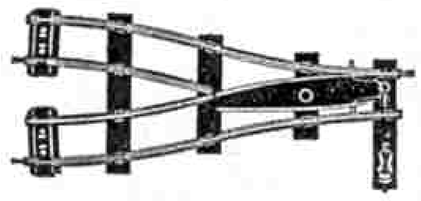
PR2



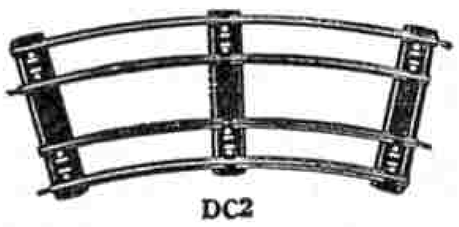
A2



CA2



PPR2

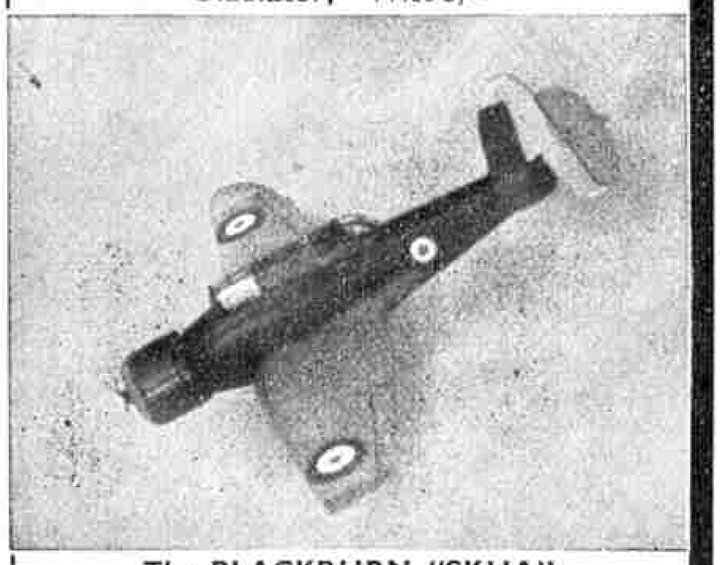


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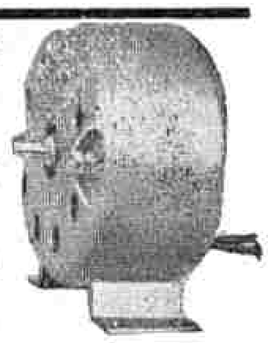
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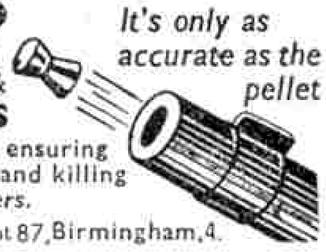
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I.C.S.

READERS' SALES AND WANTS

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Sale. Chemistry Outfit, cost 17/6, hardly used, 12/6, or nearest. "Popular Flying," July 1936–Dec. 1938 inclusive, perfect condition, 3d. each or 6/– lot.—Shireby, 19, Brooklands Avenue, Sheffield 10.

Hugo's German Self-Tuition Course. Unused. With Text Books. Complete. 30/– or exchanges.—136, Brownedge Road, Lostock Hall, Preston.

Sale. Electric Model Motor Boat, 3½ feet. Working Model Clyde Paddle "Columba." Offers.—Ritchie, Glenview, Kirkintilloch, Glasgow.

Sale. Bowman Stationary Steam Engine, twin cylinders, with brass boiler and cylinders, 12/6.—T. Warder, 319, Hurcott Road, Kidderminster.

"M.M.'s," Jan. 1924–Feb. 1931 (except Oct. 1930). Carriage paid, 2/6 per doz., or the lot 11/–.—Simpson, 194, Castlenau, S.W.13.

Selling Collection of 4,800 odd Stamps, £3, and duplicate collection of 3,000 diff., 25/–. Neither mounted now. Will consider offers.—96, Westborough Road, Westcliffe.

Sale. Electric Trains, Conjuring Outfit, Games. Send for list.—Henderson, 43, Avenue, Durham.

Sale. "M.M.'s," Jan.-Dec. 1935, Jan., July-Dec. 1936, Jan.-Dec., ex May, 1938. "O" gauge Tank Locos and Rails, clockwork. What offers?—231, Ladbroke Grove, London W.10.

Sale. Gauge "O" clockwork Railway Set; excellent condition; cost £4/10/–; accept 30/–.—G. Sordet, The Old Vicarage, Guestwick, Norfolk.

Eight Gauge "O" scale wood, glass Coach Bodies; painted, lined L.M.S.; £2. Bassett-Lowke Mail Van with ground apparatus; £1. All new condition. "Six-fut" Electric Rails; 18 straight; 20 curved; 3 points; 30/–.—Kempsey—Whins—Alderley Edge.

Sale. "Wonder" Series part works; edited Hammerton, Winchester; also Science Fiction. Send stamped envelope for lists. "M.M.'s," April 1933 to date. Offers.—H. F. Ford, 15, Mundon Road, Maldon, Essex.

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½ h.p. Petrolmotor Castings, 9/9. Interesting, instructive. Cat. 3d. Butler Aeros, Wade St., Littleover, Derby.

CRYSTAL SET KITS, complete with instructions, 3/11 post free. Buckle, 63, Avenue Approach, Bury St. Eds.

This Space is set to ½ inch s.c. and costs 8/- per month. The sum is the 50th of £20, the price of a whole page advertisement. Over 200,000 boys and parents read the "*Meccano Magazine*" each month. You can therefore reach this exclusive public for less than a half-penny a thousand.

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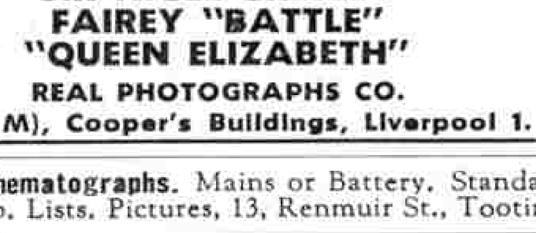
FILMS of all descriptions from 5/-. Baers, 176, Wardour St., W.1. Est. 1907. Also Hire Programmes, 7/6.

How to obtain the "M.M."

The "*M.M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall. Price 6d. per copy. As a rule, back numbers cannot be supplied, because we print only sufficient copies to fill our standing orders. To prevent disappointment, therefore, place a regular order either with your dealer, newsagent, or direct with this office.

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EDITORIAL AND ADVERTISING OFFICE:—
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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free), Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.

UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.

AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.

NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.

SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

INDIA: Karachi: Daryanamal and Bros., Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao, Calcutta; Bombay Sports Depot, 2, Lindsay Street, Madras; Bombay Sports Depot, 162, Mount Road.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

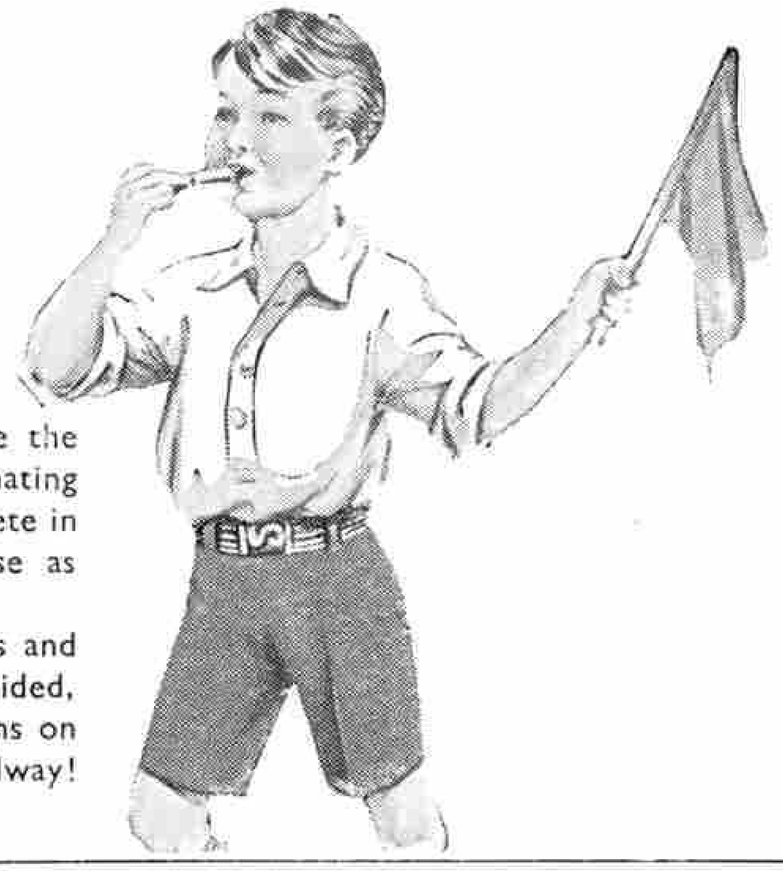
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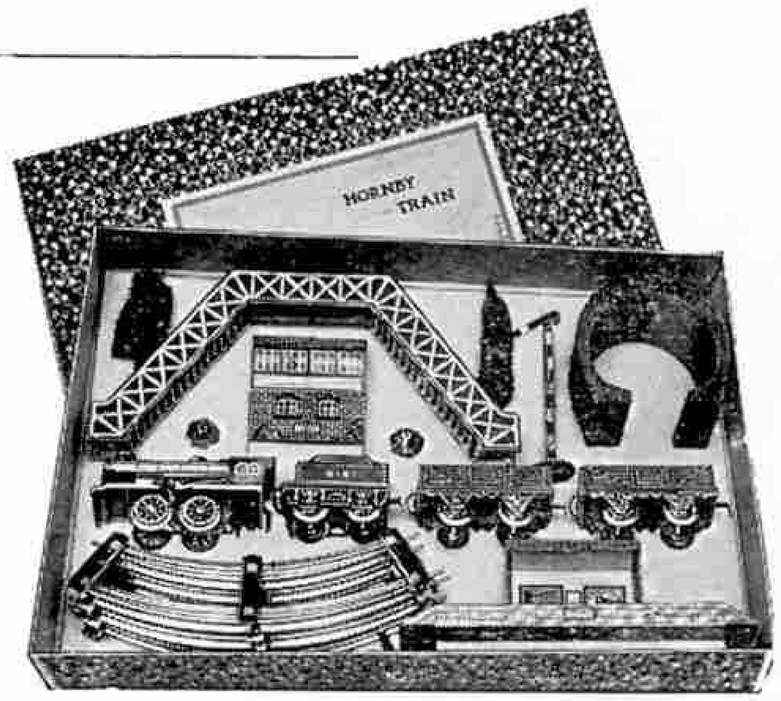
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M8 Complete Model Railway Set

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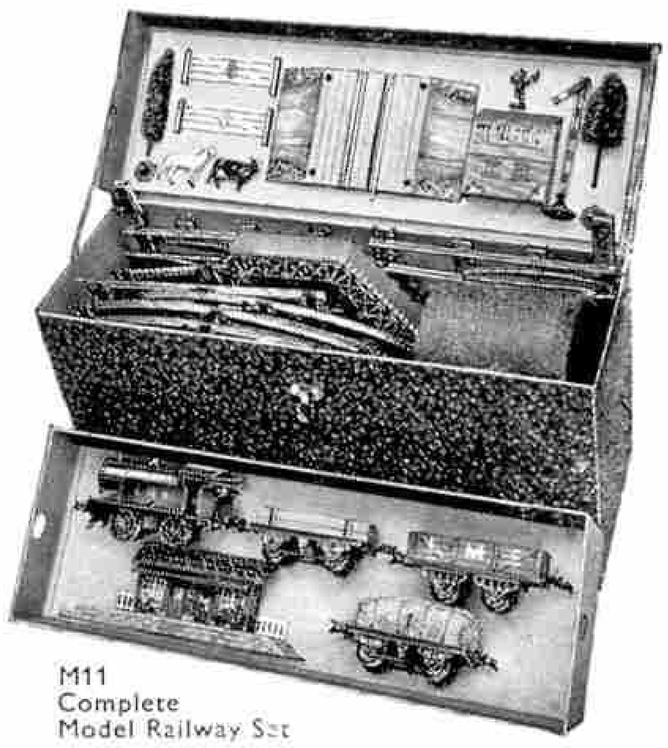
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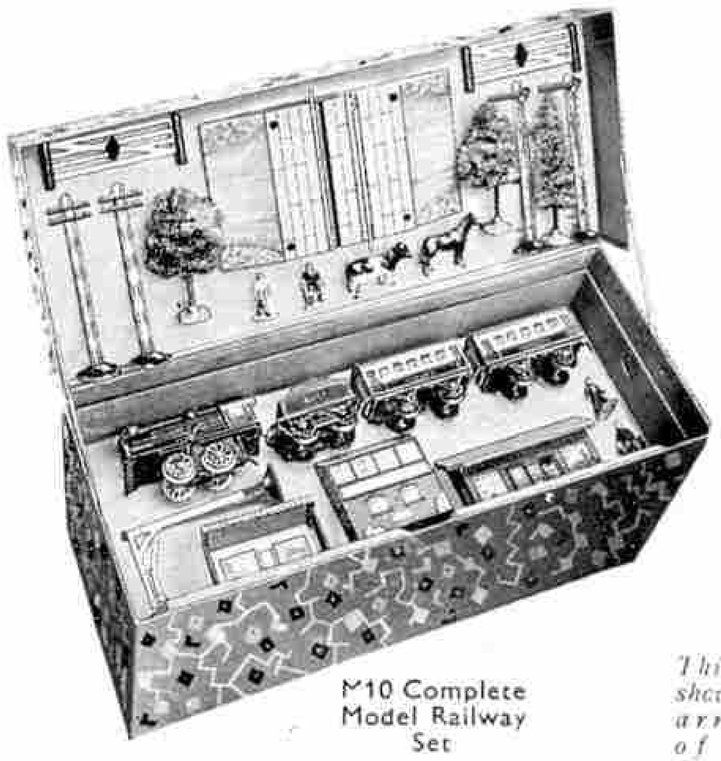
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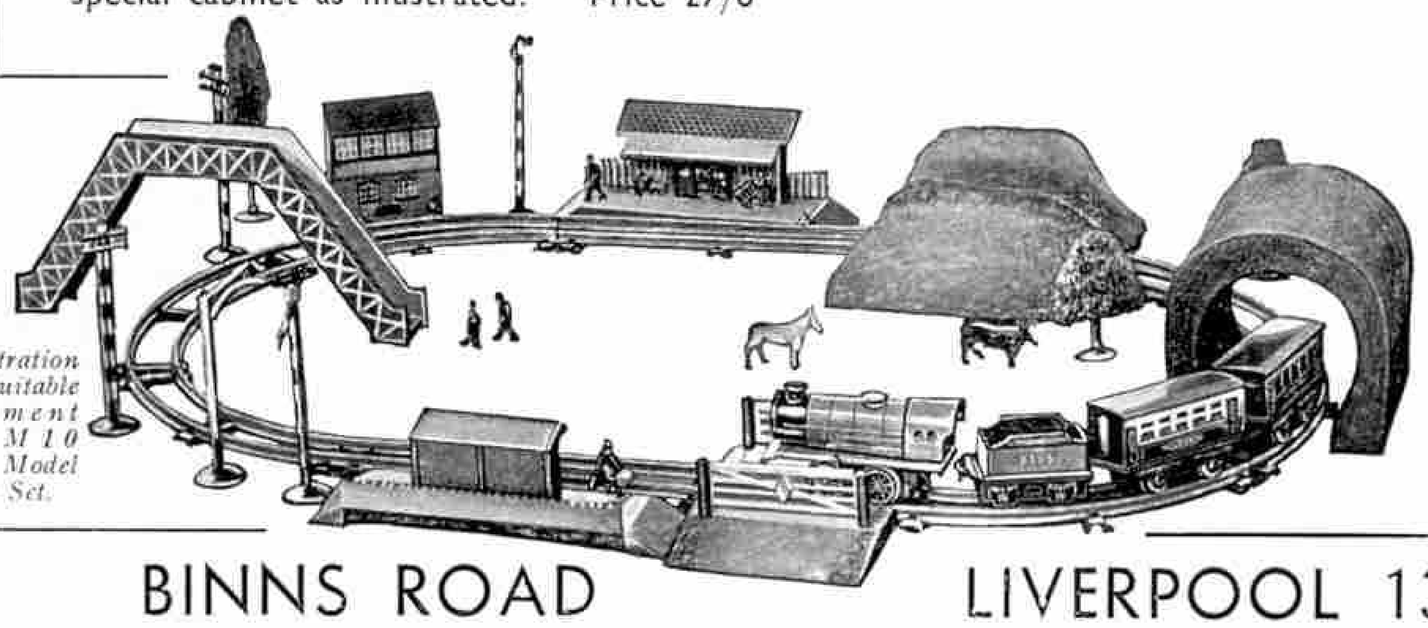
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M11
Complete
Model Railway Set



M10 Complete
Model Railway
Set



This illustration shows a suitable arrangement of the M10 Complete Model Railway Set.

MECCANO LIMITED — BINNS ROAD LIVERPOOL 13

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